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INSTALLATION AND OPERATION

NORTHEAST ELECTRONICS
Division of nt northern telecom
Airport Rd., Concord, N.H. 03301•(603) 224-6511•TELEX 94-3453

MODEL TTS 59C/CR

UNIVERSAL SENDER

INSTRUCTION MANUAL

PRINTED IN U.S.A. 4.0C-0059-30-600-0778

No. **A0059-30-600** ISSUE **1** DATE **JULY 1978**

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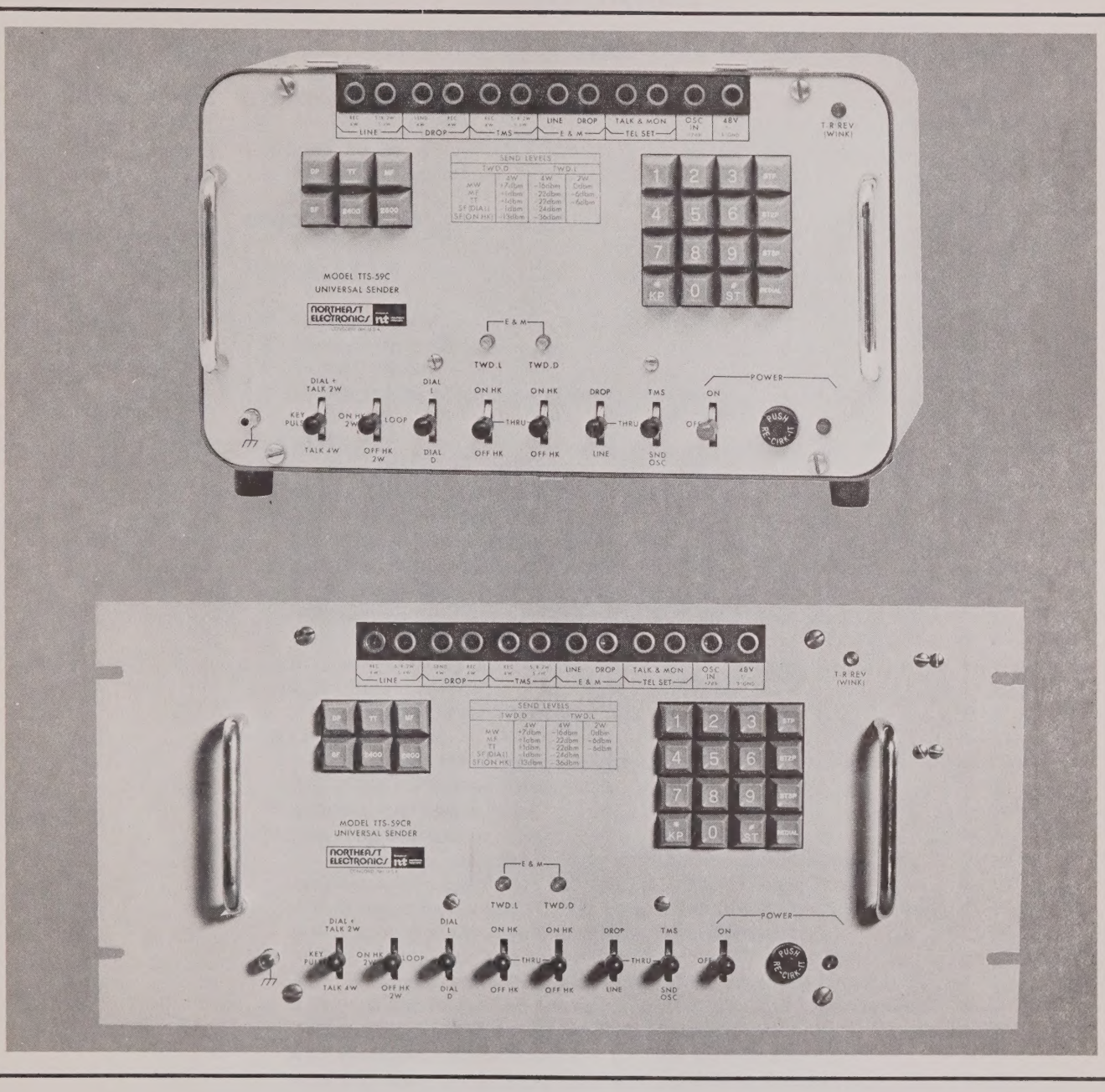

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SECTION 1

GENERAL DESCRIPTION

1.1 This manual describes the Northeast Electronics Models TTS59C and TTS59CR Universal Senders. These test sets generate supervisory and address signaling used in testing various types of telephone circuits. The sets include access and switching features that permit both sending and receiving.

1.2 Provisions are also made for connection of external oscillators and transmission measurement sets (TMS) through the TTS59C to a circuit under test. A combination of the TTS59C and a two-way TMS (such as the Northeast Electronics Model TTS44) allows accessing and as necessary, communicating with the far end circuit during transmission tests.

1.3 The Model TTS59C is a portable unit, enclosed by a metal housing and a protective cover. The TTS59CR is rack-mounted, and is identical to the TTS59C in all other respects. Except for obvious physical differences, any statement made about the TTS59C also applies to the TTS59CR.

1.4 A row of jacks across the upper edge of the front panel accepts 310-type plugs for patching to test bays, a power source, and auxiliary external instruments. A row of lever switches across the bottom of the panel controls routing of supervisory, address, and information signals. A six-button array at the left center of the panel is used to select the type of address signaling. The 16-button keypad allows selection of dialing digits and multifrequency (MF) codes. Indicators are provided to show the states of loop and E&M circuits.

1.5 **Supervisory Signaling** towards either the line or the drop is possible in three modes.

- ☐ Loop
- ☐ E&M
- ☐ SF (2400 or 2600 Hz)

1.6 **Address Signaling** toward either the line or drop is possible in five modes.

- ☐ Loop dc pulsing
- ☐ E&M dc pulsing
- ☐ SF tone pulsing (2400 or 2600 Hz)
- ☐ MF
- ☐ TT (Touchtone®, sometimes also refered to as DTMF or as Digitone®.)

The loop pulsing, E&M pulsing, and SF tone pulsing are set at 10 pps, 61 percent break. The E&M sending function can be internally programmed to provide any combination of open, ground, or battery as on-hook and off-hook conditions. The MF address signaling can be used with any of the three supervisory modes. The TT address signaling tones can also be used as information tones, such as those sent into computerized banking equipment.

1.7 Voice communication can be established with either the line or drop on two-wire or four-wire circuits. The test set accepts a type 52A, or equivalent, telephone headset for this purpose. The headset can also be used to monitor in-band tone signals sent to a circuit under test by the test set. Two-way transmission test signals can also be connected through the test set. Pads in the test set are switched to inject appropriate levels into line and drop directions on two-wire or four-wire circuits.

1.8 TYPICAL APPLICATIONS.

1.9 The Model TTS59C Universal Sender has capabilities needed for:

- ☐ Acceptance testing of new installations,
- ☐ Routine testing of in-service installations, and
- ☐ Trouble diagnosis/sectionalizing.

The test set interfaces with trunk circuits through VF patch bays and patching jack bays such as two-wire, four-wire, and six-wire patch bays. The many sending modes, including the programmable E&M mode, make the set usable with most trunk types.

1.10 INPUT POWER.

1.11 The TTS59C operates from −48Vdc central office battery at a load current of approximately 500 milliamperes. Power is applied to the set through a 310-type jack. The power switch, circuit breaker, and power indicator are clustered at the lower right corner of the front panel.

1.12 FUNCTIONAL DESCRIPTION.

1.13 Signal connections and internal switching are shown in a simplified, gerneral manner on Figure 1−1. Although signals are actually switched by relays controlled from the front panel, circuits are shown as

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if only panel switches are used. An understanding of the test set can be gained more readily with this simplified approach. An inset on Figure 1—1 identifies the major functional sections of the test set which are discussed in the following paragraphs.

1.14 The VF circuit under test switching function accepts two-wire or four-wire line and drop, send and receive VF connections via J9 through J12. Routing of signals to and from these connections is controlled by DROP/THRU/LINE switch S3 as follows:

- ☐ In THRU: Receive circuits are switched to send circuits (J9 to J11 and J12 to J10). Signals at the LINE jacks are bridged by the monitor function through R_A and R_B.
- ☐ In DROP: The LINE jacks (J11 and J12) are terminated. The DROP REC 4W jack (J9) is switched to the measurement function. The DROP SEND 4W jack (J10) is switched to the stimulus function. The DROP jacks (J9 andJ10) are bridged by the monitor function through R_A and R_B.
- ☐ In LINE: The DROP jacks (J9 and J10) are terminated. The LINE REC 4 W jack (J12) is switched to the measurement function. The LINE SEND jack (J11) is switched to the stimulus function. The LINE jacks (J11 and J12) are bridged by the monitor function through R_A and R_B.

1.15 The stimulus switching function selects either a headset transmitter, an external oscillator, an external TMS instrument, internal in-band tone signaling, or internal loop dial pulse stimuli for sending into the circuit under test via DROP/THRU/LINE switch S3. The headset transmitter is enabled in either TALK positions of the DIAL + TALK 2W/KEY PULSE/TALK 4W switch. The in-band tone signaling is enabled only in the KEY PULSE position. An external oscillator or TMS instrument can be connected through J2 or J7 to TMS/THRU/SEND OSC switch S2. A relay (shown at the left-hand side of the PADS block) senses tip-ring reversals on loop circuits under test and controls the T-R REV (WINK) indicator. Internally generated pulses control the relay for pulsing into a loop circuit under test.

1.16 The pads on Figure 1—1 act as follows:

- ☐ 0dB: Used for all operations toward the drop except in-band supervision; used for two-wire talk toward the line, including loop supervision and dialing.
- ☐ 7dB: Used for two-wire transmission loss tests and in-band address tone signaling toward the line.
- ☐ 16dB: Used for four-wire talk toward the line.
- ☐ 23dB: Used for four-wire transmission loss tests and in-band address tone signaling toward the line.
- ☐ X + 12dB: Used for in-band (SF) supervision. X = 0, 7, or 23 dB.

When an oscillator or TMS instrument is set to supply +7dBm to the TTS59C, the pads deliver the correct levels to the circuit under test. Note that incoming signals from the line side of a two-wire circuit under test can be delivered to TMS jack J7 (for measurement) and also to the internal monitor function.

1.17 The monitor and measurement function accepts signals from the line or drop side of a circuit under test, as selected by the DROP/THRU/LINE switch. These signals are combined (mixed) by R_A and R_B then amplified and switched to a headset receiver when the DIAL + TALK 2W/ KEY PULSE/TALK 4W switch is at KEY PULSE.

1.18 When this switch is at TALK 4W (and TMS/ THRU/SEND OSC is at THRU) the headset receiver is connected to the selected REC jack (J9 or J12) through the measurement function. The headset is connected to the stimulus function when the DIAL + TALK 2W/KEY PULSE/TALK 4W switch is at DIAL + TALK 2W to complete the two-wire circuit. (A muting function disables the headset receiver during dial pulsing when the DIAL + TALK 2W/KEY PULSE/TALK 4W switch is in either TALK position.)

1.19 The measurement function:

(1) switches the selected REC jack to the TMS REC 4W jack (TMS/THRU/SEND OSC switch at TMS),

(2) terminates the selected REC jack (TMS/THRU/ SEND OSC switch at THRU and DIAL + TALK/KEY PULSE/TALK 4W switch at DIAL + TALK 2W),

(3) connects a four-wire circuit under test to the monitor as described previously.

1.20 The internal signaling generator delivers dial pulses to the internal two-wire loop function and to the internal E&M switching function. Tones (SF, MF, or TT) are supplied to the stimulus function. The in-band signaling **mode** is determined by the six-button array. Address **content** is determined by the keypad.

1.21 The E&M switching function is shown at the lower right in Figure 1—1. If the E&M TWD L and TWD D switches are at THRU and the DIAL L/CENTER/DIAL D switch is at the CENTER position, the line E&M leads are carried through to the drop E&M leads. The drop M and line E leads are always monitored. The monitoring indicates E&M status. Thresholds in the monitor permit detection of voltage faults on these lines.

1.22 Signaling to a circuit under test is initiated by moving either the TWD L or TWD D switch out of the THRU position. A voltage representing the off-hook condition is switched forward in the OFF HOOK position. With the DIAL L/CENTER/DIAL D switch at DIAL L (or at DIAL D going toward the drop), the off-hook voltage is replaced with dial pulse voltages. Voltages representing the on-hook condition are switched forward with the TWD L and TWD D switches at ON-HOOK. The on-hook and off-hook voltages can be programmed to meet the needs of various trunk circuit types.

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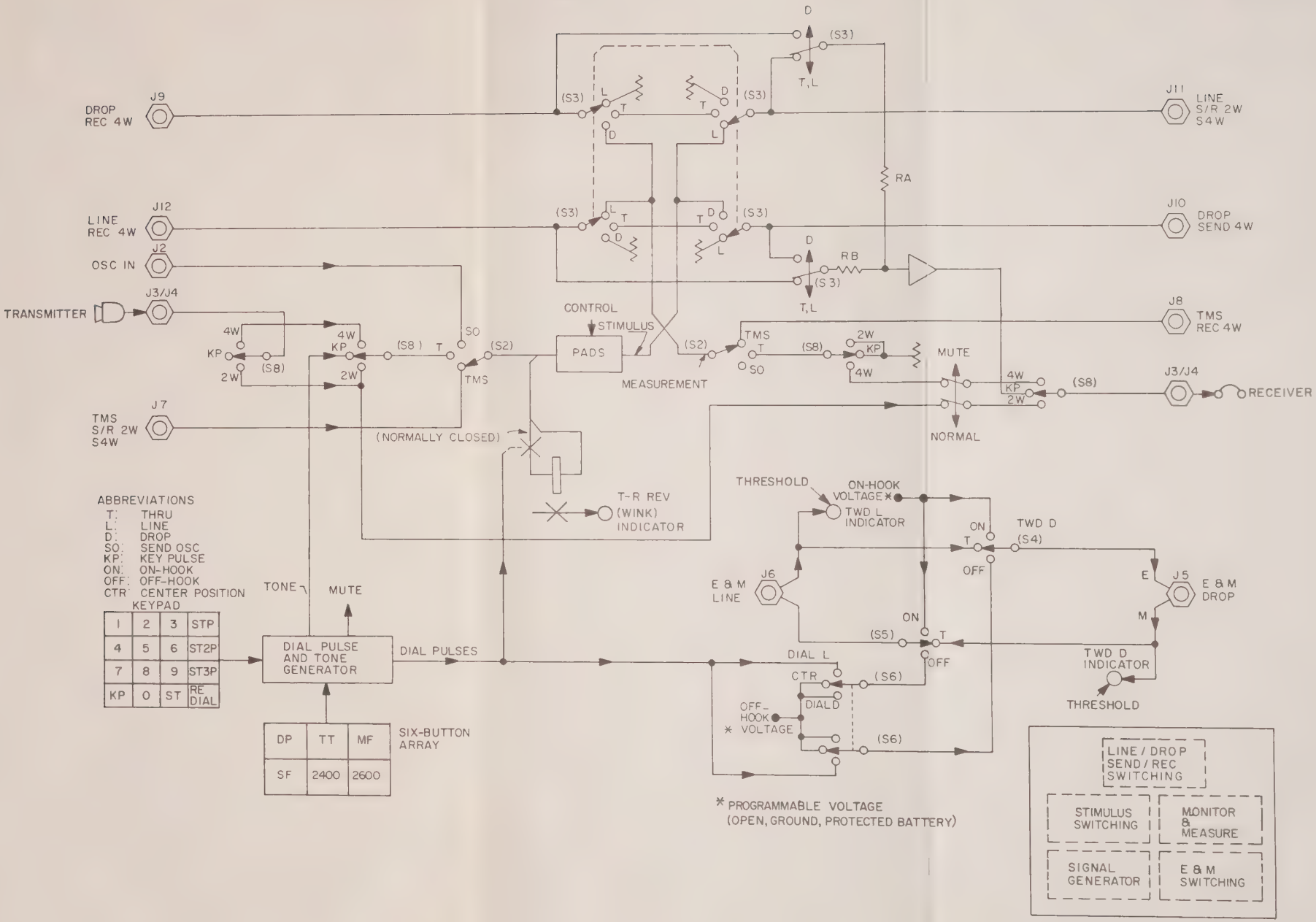

Figure 1—1. Model TTS59C General Block Diagram.

SECTION 2

SPECIFICATIONS

2.1 Table 2—1 lists the specifications of the Models TTS59C and TTS59CR Universal Senders.

Table 2—1. Models TTS59C and TTS59CR Specifications.

DIAL PULSE GENERATOR

Frequency:	10 ± 1pps
Percent break:	61 ± 3%
Interdigit time:	800 ± 50 m sec
Digit storage capacity:	up to 16 digits

IN-BAND TONE SIGNALING

Frequencies:	Standard MF, TT, plus 2400 Hz and 2600 Hz SF
Frequency accuracy:	±0.8%
Harmonic distortion:	0.8% per tone maximum

OUTPUT LEVELS:

OUTPUT TYPE	LEVEL		
	DROP SEND 4W	LINE S/R 2W S4W	
		4W	2W
MW (+7dBm at J2 or J7)	+7dBm	−16dBm	0dBm
MF, TT	+1dBm	−22dBm	−6dBm
SF (DIAL)	−1dBm	−24dBm	−8dBm
SF (ON HK)	−13dBm	−36dBm	−20dBm

OUTPUT LEVEL ACCURACY:	±1.0dB
OUTPUT IMPEDANCE:	600 ohms ± 5%
INPUT IMPEDANCE:	600 ohms ± 5%
BRIDGING IMPEDANCE:	100 K ohms
POWER REQUIREMENT:	48 Vdc at approximately 500 milliamperes
DIMENSIONS (TTS59C):	14 in w x 8¾ in h x 8 in d (35.6 cm x 22.2 cm x 20.3 cm)
WEIGHT (TTS59C):	13 lb. (5.9 kg)

Table 2—1. (Cont'd).

DIMENSIONS (TTS59CR):	19 in w x 8¾ in h x 8 in d (48.3 cm x 22.2 cm x 20.3 cm)
WEIGHT (TTS59CR):	11.5 lb. (5.2 kg.)
OPERATING TEMPERATURE RANGE:	0°C to +50°C (+32°F to +122°F)
OPERATING RELATIVE HUMIDITY:	0 to 95 % non-condensing

SECTION 3

INSTALLATION

3.1 INITIAL INSPECTION.

3.2 The unit was carefully inspected, both mechanically and electrically, before shipment. It should be operating correctly when received. To confirm this, visually inspect the unit for signs of damage during shipment. If desired, the confidence tests presented in paragraphs 4.29 through 4.36 can be used to check operation. If damage from transit is found, notify the common carrier immediately.

3.3 SERVICE INFORMATION.

3.4 Complete warranty information is contained in the purchase order agreement under terms and conditions of sale. Summarized briefly, the Northeast warranty extends for a period of one year to the original purchaser of a Northeast product.

3.5 A Return Material Authorization (RMA) number must be obtained from Northeast before any equipment is returned for factory repair. Service assistance and/or an RMA number can be obtained by contacting the Customer Service Department at Northeast Electronics, P.O. Box 694, Concord, New Hampshire 03301, telephone: (603) 224-6511.

3.6 TTS59C POWER.

3.7 The TTS59C operates from 48-Vdc central office battery at approximately 500 milliamperes. Power connection is made via a 310-type jack located on the front panel.

3.8 TTS59CR RACK MOUNTING AND POWER CONNECTION.

3.9 The TTS59CR is designed to mount in a 19-inch (48.3 cm) standard relay rack and requires 8¾ inches (22.2 cm) of vertical space. The unit is secured in the rack by four customer-supplied screws.

3.10 As shown on Figure 3—1, 48-Vdc operating power can be connected to a terminal strip mounted on the rear of the front panel. The 310-type front panel jack is also available for this use. The power required is 48 Vdc at approximately 500 milliamperes.

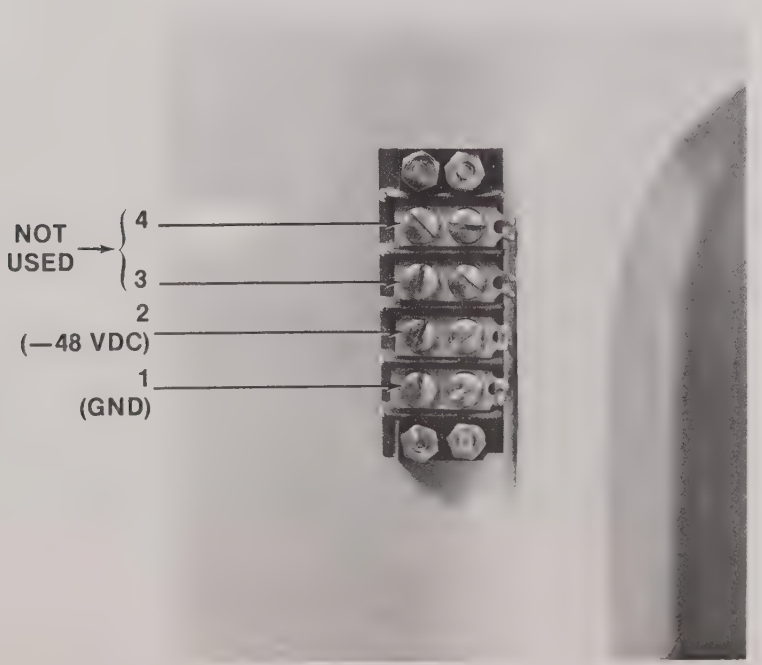

Figure 3—1. TTS59CR Power Terminal Strip.

SECTION 4

OPERATION

4.1 Maximum utility of the Model TTS59C Universal Sender can be realized only when a thorough understanding of the jack access and switching capabilities has been obtained. Therefore, it is recommended that the descriptive material given for test set controls and access jacks be carefully and thoroughly studied before attempting any operating procedures. In addition, the general operating considerations presented in paragraphs 4.4 through 4.28 are important, especially the instructions for programming the test set to meet interface requirements. The detailed operating instructions are illustrated to show the signal flow for each type of use. Voice frequency test conditions are summarized in Table 4—4.

4.2 CONTROLS, INDICATORS, AND JACKS.

4.3 All front panel controls, indicators, and jacks are identified in Figure 4—1. Table 4—1 lists the twelve 310-type access jacks located at the top center of the panel. The table is arranged to show the application of each jack and the internal incoming and outgoing connections made to each jack by various switching combinations. Table 4—2 lists seven of the eight lever switches. This table identifies the application of each switch, describes the influence of each switch on incoming and outgoing signals, and identifies all related switching requirements for each switch position. The address signaling controls included in the six-button array and the sixteen-button keypad are described in Table 4—3. This table includes applications and related switching requirements. Table 4—5 describes the front panel indicators.

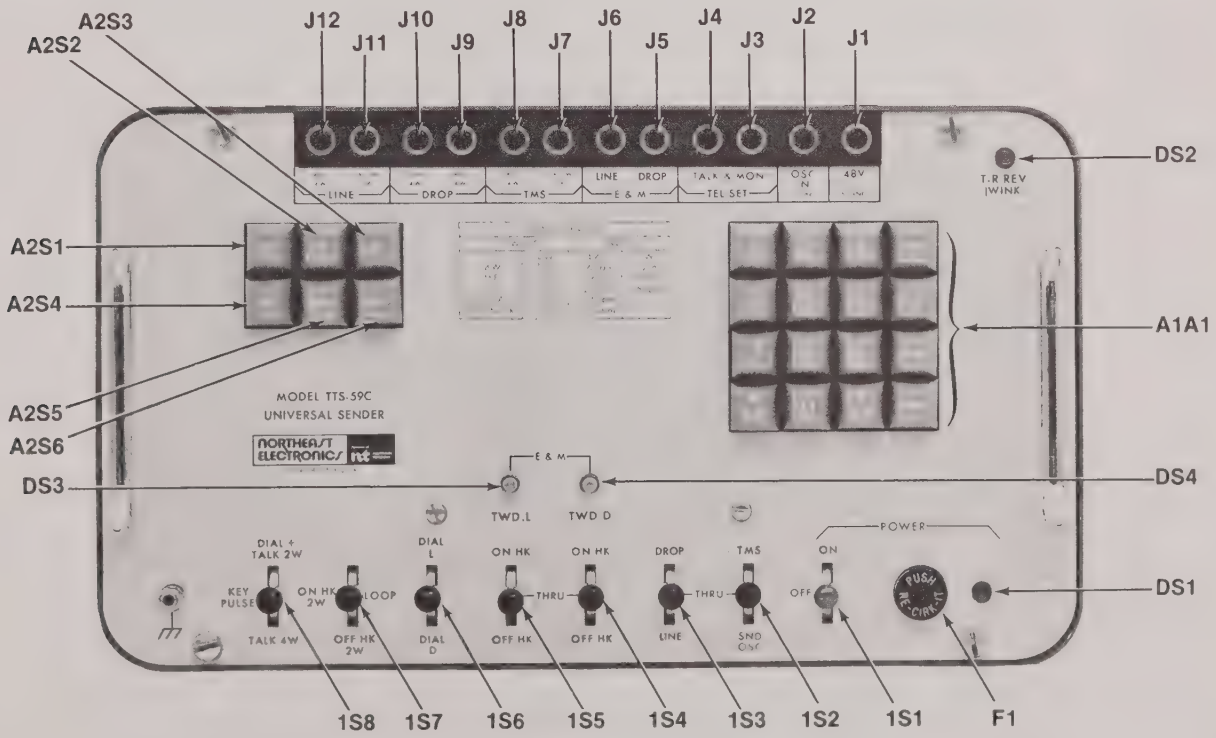

Figure 4—1. Model TTS59C Operating Controls.

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REF DES	NOMENCLATURE	INCOMING		TEST SET APPLICATION(S)	OUTGOING	
		EXTERNAL SOURCE	SWITCHED TO		SWITCHED FROM	EXTERNAL DESTINATION
J1	48V, T = −, S = GND	Office or accessory supply.	Test set circuits.	All	Not applicable	Not applicable
J2	OSC IN +7dB	Test oscillator; (appropriate levels delivered to circuit under test with +7dBm input).	J11 or J10 (SEND) and J3/J4 (MONITOR).	Transmission path loss and gain-slope tests.	Not applicable.	Not applicable.
J3/J4	TEL SET TALK & MONITOR	Transmitter of type 52A or equivalent telephone headset.	J11 or J10 (SEND)	Sending: communication with far end. Receiving a. communication with far end b. through-connected VF circuit under test. Monitor: a. external TMS or oscillator signal. b. In-band supervisory and addressing signals.	a J12 or J9 (REC) b. J12 or J9 (REC) c. J2 (OSC) or J7 (TMS) d. Tone generator	Receiver of type 52A or equivalent telephone headset.
J5	E&M DROP	Drop M lead	Line M lead (with TWD L OFF HK/THRU/ON HK switch at THRU) and TWD D indicator DS4.	All E&M operations.	Line E lead (with TWD D OFF HK/THRU/ON HK switch at THRU) or E&M supervision and pulsing circuit (with TWD L switch at ON HK or OFF HK).	Drop E lead
J6	E&M LINE	Line E lead	Drop E lead (with TWD D OFF HK/THRU/ON HK switch at THRU) and TWD L indicator DS3.	All E&M operations.	Drop M lead (with TWD L OFF HK/THRU/ON HK switch at THRU) or E&M supervision and pulsing circuit (with TWD L switch at ON HK or OFF HK).	Line M lead.
J7	TMS S/R 2W S4W (SEND/RECEIVE TWO-WIRE, SEND FOUR-WIRE; given as TMS SEND in text).	TMS instrument	J11 or J10 (SEND) and J3/J4 (MONITOR).	Transmission loss and gain-slope tests, especially as implemented with TMS sets having send and receive capabilities.	J11 (receiving two-wire).	TMS instrument
J8	TMS REC 4W	Not applicable	Not applicable	Transmission loss and gain-slope tests, especially as implemented with TMS set having send and receive capabilities.	J12 or J9 (REC).	TMS instrument
J9	DROP REC 4W	Drop four-wire VF circuit.	a. J11 (SEND) and J3/J4 (MONITOR). b. 600-ohm termination. c. 600-ohm termination and J3/J4 (MONITOR). d. J3/J4 (MONITOR). e. J8 (MEASURE) and J3/J4 (MONITOR).	a. Through-connected, monitored circuit under test. b. Any operation toward the line. c. Sending in-band supervisory or address signals. d. Sending external oscillator signal or communicating. e. Transmission loss and gain-slope test (receiving TMS signals).	Not applicable	Not applicable.

Table 4—1. Model TTS59C Front Panel Access Jacks.

REF DES	NOMENCLATURE	INCOMING		TEST SET APPLICATION(S)	OUTGOING	
		EXTERNAL SOURCE	SWITCHED TO		SWITCHED FROM	EXTERNAL DESTINATION
J10	DROP SEND 4W	Not applicable	Not applicable	a. Through-connected circuit under test. b. Any operation toward the line. c. Sending in-band supervisory or address signals. d. Talking on four-wire drop circuit under test. e. Transmission loss and gain-slope tests (sending oscillator signal). f. Transmission loss and gain-slope tests (sending TMS signal.)	a. J12 (REC). b 600-ohm termination. c. Tone generator (SF, TT, MF) d. J3/J4 (TRANSMITTER). e. J2 (OSC). f. J7 (TMS).	Drop four-wire VF circuit.
J11 On 2W	LINE S/R 2W S4W (SEND/ RECEIVE TWO-WIRE, SEND FOUR-WIRE, given as LINE SEND in text).	Line two-wire VF circuit.	a. J9 (REC) and J3/J4 (MONITOR). b. J7 (TMS) and J3/J4 (MONITOR). c. J3/J4 (MONITOR).	a. Through-connected, monitored two-wire circuit under test b. Transmission loss and gain-slope tests. c. Communication on two-wire circuit. d. Transmission loss and gain-slope tests (sending oscillator signal). e. Sending supervisory and addressing signals.	a. J7 (TMS b. J3/J4 (MONITOR). c. J2 (OSC). d. Supervisory circuit and dial pulse generator.	Line two-wire VF circuit.
J11 On 4W	Not applicable	Not applicable	Not applicable	a. Through-connected four-wire circuit under test. b. Any operation toward the drop. c. Sending in-band supervisory or addressing signal. d. Talking on four-wire line circuit under test. e. Transmission loss and gain-slope tests (sending TMS signal). f. Transmission loss and gain-slope tests (sending oscillator signal).	a. J9 (REC). b. 600-ohm termination. c. Tone generator (SF, TT, MF). d. J3/J4 (MONITOR). e. J7 (TMS). f. J2 (OSC).	Line four-wire VF circuit.
J12	LINE REC 4W (Jack includes switch that inserts 16dB-pad when plug inserted and 1S3 in LINE position.)	Line four-wire VF circuit.	a. J10 (SEND) and J3/J4 (MONITOR). b. 600-ohm termination. c. 600-ohm termination and J3/J4 (MONITOR). d. J3/J4 (MONITOR). e. J8 (TMS) and J3/J4 (MONITOR)	a. Through-connected, monitored circuit under test b. Any operation toward the drop. c. Sending in-band supervisory or addressing signals. d. Sending external oscillator signal or communicating. e. Transmission loss and gain-slope tests (receiving TMS signal).	Not applicable.	Not applicable

Table 4—1. (Cont'd).

REF DES	NOMENCLATURE	POSITION	INFLUENCE ON LINE OR DROP SIGNALS		ASSOCIATED SWITCHING REQUIREMENTS	APPLICATION
			FROM CIRCUIT UNDER TEST TO TEST SET	FROM TEST SET TO CIRCUIT UNDER TEST		
1S2	TMS/THRU/SEND OSC	TMS	Connects LINE REC 4W jack J12 or DROP REC 4W jack J9 to TMS REC 4W jack J8; connects LINE S/R 2W S4W jack J11 to TMS S/R 2W S4W jack J7.	Connects TMS S/R S4W jack J7 to DROP SEND 4W jack J10 or LINE S/R 2W S4W jack J11.	Select LINE or DROP (1S3); select KP (1S3) to monitor outgoing TMS tone and select REC jack (J9 or J12).	Two-and four-wire transmission loss and gain-slope tests.
		THRU	Permits termination of selected REC jack (J9 or J12) while sending in-band supervisory and address signals.	Permits connection of transmitter, dial or in-band signaling to SEND jack J11 or J10.	Select LINE or DROP (1S3).	See 1S8.
		SEND OSC	None	Connects OSC IN +7dB jack J2 to selected SEND jack (J11 or J10).	Select LINE or DROP (1S3); select KP (1S3) to monitor outgoing tone and selected REC jack (J12 or J9).	Transmission loss and gain-slope tests.
1S3	DROP/THRU/LINE	LINE	Connects LINE REC 4W jack J12 to monitor and measurement circuits (four-wire tests);connects LINE S/R 2W, S4W to monitor and measurement circuits (two-wire tests). Terminates J9 (600 ohms).	Connects stimulus circuit (such as TMS) to monitor and LINE S/R 2W S4W jack J11; inserts 7-dB- pad into send path (except during two-wire dial pulsing); allows insertion of 16-dB pad (23dB total) during four-wire line tests. See J12. Terminates J10 (600 ohms).	Select KP (1S8); to monitor non-talk stimulus.	VF operations toward the line.
		THRU	Connects LINE REC 4W jack J12 to DROP SEND 4W jack J10 and monitor; connects DROP REC 4W jack J9 to LINE S/R 2W S4W jack J11 and monitor.	See column 4; stimulus circuit disconnected.	Select KP (1S8) to monitor REC jacks (J12 and J9).	Pass uninterrupted circuit through test set.
		DROP	Connects DROP REC 4W jack J9 to monitor and measurement circuits; terminates J12 (600 ohms).	Connects stimulus circuit (such as TMS) to monitor and DROP SEND 4W jack J10.	Select KP (1S8) to monitor non-talk stimulus.	VF operations toward the drop.
1S4	TWD D ON HK/THRU/ OFF HK	ON HK	None.	Sends on-hook to drop on E lead jack J5.	None.	E&M operations toward the drop.
		THRU	Connects line E lead jack J6 to drop E lead jack J5	See column 4.	1S6 must be in CENTER position.	E&M operations toward the line; pass uninterrupted circuit under test E lead through test set.
		OFF HK	None.	Sends off-hook or address to drop on E lead jack J5.	Select DIAL D (1S6) to address.	E&M operations toward the drop.
1S5	TWD L ON HK/THRU/ OFF HK	ON HK	None.	Sends on–hook to line on M lead jack J6.	None.	E&M operations toward the line.
		THRU	Connects drop M lead jack J5 to line M lead jack J6.	See column 4.	1S6 must be in CENTER position.	E&M operations toward the drop; pass uninterrupted circuit under test M lead through test set.
		OFF HK	None.	Sends off–hook or address to line on M lead jack J6.	Select DIAL L (1S6) to address.	E&M operations toward the line.

Table 4—2. Model TTS59C Front Panel Lever switches.

REF DES	NOMENCLATURE	POSITION	INFLUENCE ON LINE OR DROP SIGNALS		ASSOCIATED SWITCHING REQUIREMENTS	APPLICATION
			FROM CIRCUIT UNDER TEST TO TEST SET	FROM TEST SET TO CIRCUIT UNDER TEST		
1S6	DIAL D/CENTER/DIAL L	DIAL D	None.	Connects dial pulses to drop E lead jack J5 through 1S4.	Select TWD D OFF HK (1S4).	E&M operations toward the drop.
		CENTER	None.	Disables E&M addressing.	None.	Through-connected circuit under test E&M circuit.
		DIAL L	None.	Connects dial pulses to line M lead jack J6 through 1S6.	Select TWD L OFF HK (1S5).	E&M operations toward the line.
1S7	LOOP ON HK 2W/ OFF HK 2W	ON HK 2W	None.	Sets two-wire on-hook condition.	Select DIAL + TALK 2W (1S8).	Beginning and final condition for line two-wire operations.
		OFF HK 2W	Connects LINE S/R 2W S4W jack J11 to T-R REV (WINK) indicator (DS2).	Sends "off-hook" to LINE S/R 2W S4W (J11), connects dial pulses.	Select LINE (1S3) and DIAL + TALK 2W (1S8).	Signaling two-wire line circuit.
1S8	DIAL + TALK 2W/KEY PULSE/TALK 4W	DIAL + TALK 2W	Connects LINE S/R 2W S4W jack J11 to monitor.	Connects transmitter to LINE S/R 2W S4W jack J11 and monitor.	Select THRU (1S2) and LINE (1S3).	Communicate on two-wire circuit.
		KEY PULSE (KP)	Enables monitor channels A and B; see Table 4—5.	Connects in-band supervisory and addressing signals to LINE S/R 2W S4W (J11) or DROP SEND 4W (J10).	Select THRU (1S2) and LINE or DROP (1S5).	Sending in-band supervisory and addressing signals.
		TALK 4W	Connects LINE REC 4W jack J12 or DROP REC 4W jack J9 to monitor.	Connects transmitter to LINE S/R 2W S4W jack J11 or DROP SEND 4W jack J10.	Select THRU (1S2) and LINE or DROP (1S3).	Communicate on four-wire circuit.

Table 4—2. (Cont'd).

REF DES	NOMEN-CLATURE	PURPOSE	APPLICATION(S)	ASSOCIATED SWITCHING REQUIREMENTS
A2S1	DP	When latched, enables 10-pps dial pulse generator.	a. Loop dial pulsing. b. E&M pulsing. c. SF addressing.	a. Select loop OFF HK 2W; use keypad numerals. b. Select DIAL L (or D) and set E&M L (or D) at OFF HK; use keypad numerals. c. Select KP (not TALK; 1S8), set 1S2 at THRU; see A2S4.
A2S2	TT	Enables standard Touch-Tone® addressing, latching.	TT addressing and TT information functions.	Select KP (not TALK;1S8), set 1S2 at THRU; use keypad numerals.
A2S3	MF	When latched, enables standard two-of-five multi-frequency addressing.	MF addressing.	Select KP (not TALK; 1S8), set 1S2 at THRU; use keypad numerals.
A2S4	SF	When latched, enables single frequency signal in conjunction with 2400 and 2600.	a. SF on-hook supervision. b. SF addressing.	a. Latch 2400 or 2600; select KP (not TALK; 1S8), set 1S2 at THRU. b. Latch 2400 or 2600, latch DIAL; see also entry c under A2S1.
A2S5	2400	When latched, selects 2400 Hz for SF tone.	SF supervisory and addressing signals.	Latch SF; see also A2S4.
A2S6	2600	When latched, selects 2600 Hz for SF tone.	SF supervisory and addressing signals.	Latch SF; see also A2S4.
None	0 9	Numeral buttons	All addressing modes.	Latch DIAL, TT or MF
None	* KP	Keypulse...prepares receiving circuit for digits.	Precedes dialing digits in MF addressing.	None.
None	# ST	Start pulse...indicates all digits have been sent	Follows dialing digits in MF addressing.	None
None	STP, ST2P, ST3P	TSPS and other functions	MF information.	None
None	REDIAL	Causes last-entered dial-address to be retransmitted once each time button is pressed.	See A2S1	See A2S1, but numerals are not to be re-struck. Signal 'on-hook' before striking REDIAL.

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Tabel 4—3. Model TTS59C Addressing Controls.

ITEM	APPLICATION	DROP/ THRU/ LINE (1S3)	TMS/ THRU/ OSC SEND (1S2)	DIAL + TALK 2W/ KEY PULSE/ TALK 4W (1S8)	LINE REC 4W (J12) FEEDS:	DROP REC 4W (J4) FEEDS:	TMS S/R 2W S4W (J7) FEEDS (GETS):	OSC IN (J2) FEEDS:	TRANSMITTER (J3/J4) FEEDS:	MONITOR (J3/J4)			LINE S/R 2W S4W (J11) GETS (FEEDS):	DROP SEND (J10) GETS (FEEDS):	TMS REC 4W (J8) GETS:	REFERENCES	
										KP CHAN A	KP CHAN B	TALK DP'S				FIGURE(S)	PARA-GRAPH(S)
1	DIAL and TALK two-wire toward LINE.	LINE	THRU	DIAL + TALK 2W	-	-	-	-	LINE S/R 2W S4W & Monitor	-	-	LINE S/R 2W S4W & TRANSMITTER	Transmitter, (Monitor)	Term	-	4–5	4.43
2	TALK four-wire toward LINE.	LINE	THRU	TALK 4W	Monitor	Term	-	-	LINE S/R 2W S4W		-	LINE REC 4W	Transmitter	Term	-	4–22	Various
3	TALK four-wire toward DROP.	DROP	THRU	TALK 4W	Term	Monitor	-	-	DROP SEND 4W	-		DROP REC 4W	Term	Transmitter	-	4–23	Various
4	SEND in-band supervisory or address signals toward LINE (2W).	LINE	THRU	KEY PULSE	-	-	-	-	-	LINE S/R 2W S4W & SF, MF, or TT	-	-	SF, MF, TT (Monitor)	Term	-	4–8, 4–10, 4–12	4.47, 4.49 4.51
5	SEND in-band supervisory or address signals toward LINE (4W).	LINE	THRU	KEY PULSE	Term & Monitor	Term	-	-	-	SF, MF, or TT	LINE REC 4W		SF, MF, TT	Term		4–18, 4–20 4–7	4.61, 4.63
6	SEND in-band supervisory or address signals toward DROP (2W).	DROP	THRU	KEY PULSE	-	-	-	-	-	-	DROP SEND 4W & SF, MF, or TT	-	Term	SF, MF, TT (Monitor)	-	4–9, 4–11, 4–13	4.45, 4.47, 4.49, 4.51
7	SEND in-band supervisory or address signals toward DROP (4W).	DROP	THRU	KEY PULSE	Term	Term & Monitor	-	-	-	DROP REC 4W	SF, MF, or TT	-	Term	SF, MF, TT	-	4–19, 4–21	4.61, 4.63
8	TMS operations toward the LINE (2W).	LINE	TMS	KEY PULSE	-	-	LINE S/R 2W S4W & Monitor (LINE S/R 2W S4W)	-	-	TMS S/R 2W S4W & LINE S/R 2W, S4W	-	-	TMS S/R 2W S4W (TMS S/R 2W S4W & Monitor)	Term	-	4–16	4.55
9	TMS operation toward the LINE (4W).	LINE	TMS	KEY PULSE	TMS REC 4W & Monitor	Term	LINE S/R 2W S4W & Monitor	-	-	TMS S/R 2W, S4W	LINE REC 4W	-	TMS S/R 2W S4W	Term	LINE REC 4W	4–24	4.67
10	TMS operations toward the DROP (2W).	DROP	TMS	KEY PULSE	-	-	DROP SEND 4W & Monitor (DROP SEND 4W)	-	-	-	DROP SEND 4W & TMS S/R 2W S4W	-	Term	TMS S/R 2W S4W (TMS S/R 2W S4W & Monitor)	-	4–17	4.55
11	TMS operations toward the DROP (4W).	DROP	TMS	KEY PULSE	Term	TMS REC 4W & Monitor	DROP SEND 4W & Monitor	-	-	DROP REC 4W	TMS S/R 2W, S4W	-	Term	TMS S/R 2W S4W	DROP REC 4W	4–25	4.67
12	EXT oscillator toward the LINE (2W).	LINE	OSC SEND	KEY PULSE	-	-	-	LINE S/R 2W S4W & Monitor	-	OSC IN & LINE S/R 2W, S4W	-	-	OSC IN (Monitor)	Term	-	4–16	4.58
13	EXT oscillator toward the LINE (4W).	LINE	OSC SEND	KEY PULSE	Monitor	Term	-	LINE S/R 2W S4W & Monitor	-	OSC IN	LINE REC 4W	-	OSC IN	Term	-	4–24	4.69
14	EXT oscillator toward the DROP (2W).	DROP	OSC SEND	KEY PULSE	-	-	-	DROP SEND 4W & Monitor	-	-	OSC IN & DROP SEND 4W		Term	OSC IN (Monitor)	-	4–17	4.58
15	EXT oscillator toward the DROP (4W),	DROP	OSC SEND	KEY PULSE	Term	Monitor	-	DROP SEND 4W & Monitor	-	DROP REC 4W	OSC IN	-	Term	OSC IN	-	4–25	4.69

Table 4–4. Model TTS59C VF Switching Summary.

Table 4—5. Model TTS59C Front Panel Indicators.

REF DESIG	NOMENCLATURE	DESCRIPTION
DS1	POWER	When lighted, indicates that POWER switch is ON and power is applied to unit.
DS2	T-R REV (WINK)	Indicates tip/ring polarity status on loop circuits. Normally lighted when tip more negative than ring. But, internal programming can reverse this indication (see paragraph 4.13).
DS3	E&M TWD L	Indicates idle/busy status of E lead on line side of E&M circuits. Normally lighted for open condition on E lead to indicate idle circuit. But, internal programming can change this indication (see paragraph 4.20).
DS4	E&M TWD D	Indicates idle/busy status of M lead on drop side of E&M circuits. Normally lighted for ground or open condition on M lead to indicate idle circuit. But, internal programming can change this indication (see paragraph 4.20).

4.4 GENERAL OPERATING CONSIDERATIONS.

4.5 Paragraphs 4.6 through 4.28 contain general operating information relative to all of the operating procedures.

4.6 POWER CONSIDERATIONS.

4.7 The model TTS59C operates from a central office battery supply within the range of 43 to 56 Vdc. The approximate current drawn by the unit is 500 milliamperes. The input power is connected via a 310-type jack wired to receive ground on the sleeve and −48 Vdc on the tip.

4.8 RELATED TMS TEST EQUIPMENT.

4.9 Transmission tests such as level, circuit noise and noise-to-ground can be conducted thru the TTS59C by using an external TMS such as the Northeast Electronics Model TTS44. The TMS is connected to a two-wire or four-wire circuit under test through the switching circuits of the TTS59C. The TMS S/R 2W S4W jack accepts TMS outputs for connection to the TMS. The TMS REC jack delivers signals from a four-wire circuit to the TMS. Pads in the TTS59C control the level inserted into the circuit under test. See the milliwatt entry of Table 4—6.

Table 4—6. Model TTS59C Output Levels.

OUTPUT TYPE	LEVEL		
	DROP SEND 4W	LINE S/R 2W S4W	
		4W	2W
MW (+7dBm at J2 or J7)	+7dBm	−16dBm	0dBm
MF, TT	+1dBm	−22dBm	−6dBm
SF (DIAL)	−1dBm	−24dBm	−8dBm
SF (ON HK)	−13dBm	−36dBm	−20dBm

4.10 Various common telephone office test lines can be dialed up via the TTS59C. Type 100, 102, and 103 test lines can be used when making signaling and addressing tests with the TTS59C alone. Type 100, and 102 test lines can be dialed when making transmission tests with an external oscillator or TMS.

4.11 TEST SET INTERNAL PROGRAMMING.

4.12 Paragraphs 4.13 through 4.20 provide the information required to program the unit's internal tip-ring reversal sensing function, the E&M send levels, E&M receive threshold levels, and the E&M indicator options.

4.13 Internal Tip-Ring Reversal Programming.

4.14 The T-R REV (WINK) indicator can be wired to be lighted with normal or reversed input polarity. The TTS59C, as shipped from the factory is wired to produce a lighted indication when the tip of a two-wire circuit is negative with respect to the ring. Figure 4—2 shows the location of strapping terminals A, B, and C on the relay board. When A is strapped to B, the T-R REV indicator will be lighted when the tip is negative. When A is strapped to C, the indicator will be lighted when the tip is positive with respect to the ring.

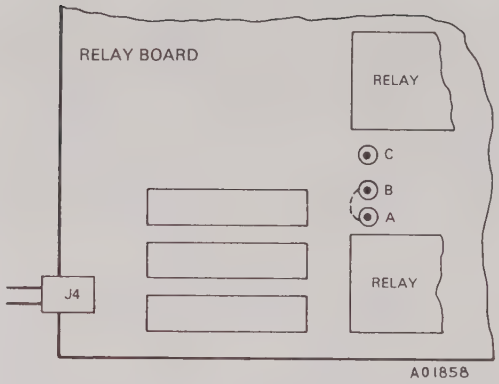
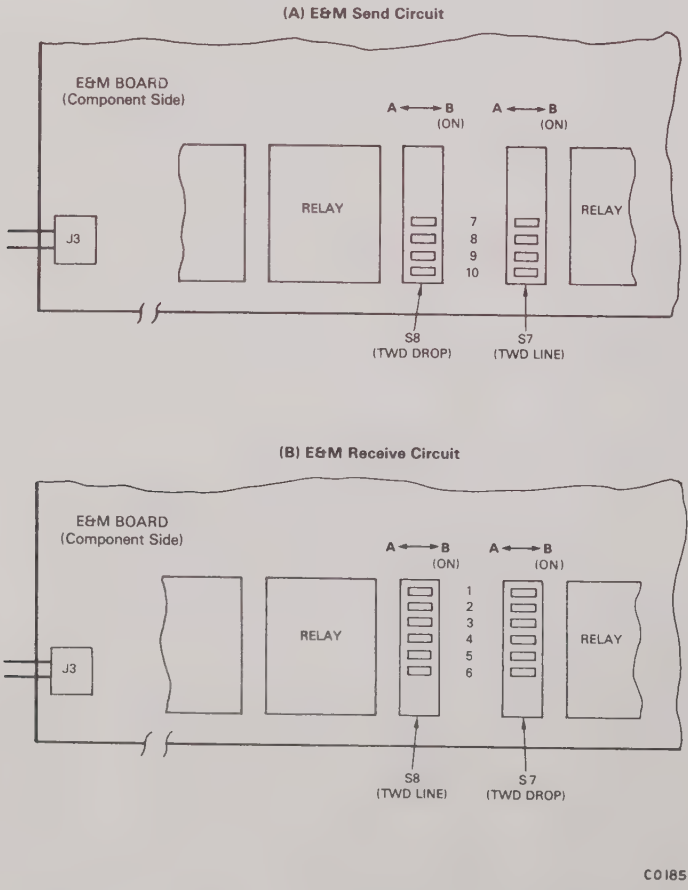


Figure 4—2. Tip-Ring Reversal Strap Location.

4.15 Internal E&M Send Function Programming.

4.16 The TTS59C is capable of sending any two-state combination of open, ground, and battery on the line M lead and the drop E lead. Programming is independent for each of these leads. Selection is made by setting miniature, ten-section switches. As shown on Figure 4-3A, 1A2S7 controls the line and 1A2S8 controls the drop. The switches are mounted on the E&M board.

4.17 Switch sections 7 and 8 set the on-hook condition. Switch sections 9 and 10 set the off-hook condition. Figure 4-3A indicates the direction in which the switch tabs are to be moved to set positions A and B. The table accompanying Figure 4-3A shows the switch positions required to set any of the combinations required. **Set the switches only after power has been removed from the unit.** Use a slender tool such as a small screwdriver or a pencil to manipulate the switches.



TO SEND:		SET SECTION: 7	8	9	10
ON-HOOK	OPEN	A	A	—	—
	GND	A	B	—	—
	BAT	B	A	—	—
OFF-HOOK	OPEN	—	—	A	A
	GND	—	—	A	B
	BAT	—	—	B	A

THRESHOLD	SET SECTION: 1	2	3	4
−7.5V	B	A	A	A
−8.5V	A	B	A	A
−11.5V	A	A	B	A
−14.5V	A	A	A	B

INDICATION	SET SECTION: 5	6
Lighted if IDLE		
1. BAT	A	B
2. OPEN OR GND	B	A
Lighted if BUSY		
1. BAT	A	B
2. OPEN OR GND	B	A

Figure 4—3. E&M Board Programming Switch Locations.

4.18 **Internal E&M Receive Function Programming.**

4.19 The TTS59C E&M circuits receiving the line E and drop M leads use minimum-voltage thresholds. The thresholds test received voltages. An out-of-limits input will not produce the correct TWD L or TWD D indication. The different needs of various office types and of different test conditions are met by providing variable thresholds. The thresholds are set by sections 1 through 4 of 1A2S7 for drop and 1A2S8 for line. These are shown on Figure 4-3B. An associated table shows the four available threshold voltages and their corresponding switch settings. Find the appropriate threshold and set switches as follows.

a. For each lead, find the threshold closest to the office minimun that is not more negative than this minimum.

b. Set 1A2S7 and 1A2S8 sections 1 through 4 as indicated in the table accompanying the figure. Voltages are referenced to patch bay ground. When received voltage is below the threshold voltage, tha associated indicator will not change state.

4.20 Each E&M indicator (TWD D or TWD L) can be programmed to be lighted when a circuit under test is idle (dark when a circuit is busy). Or, each indicator can be set for just the opposite indicating state. The unit is shipped with settings that produce lighted indications for those circuits which send open on the E lead (line) and ground or open on the M lead (drop) in the idle state. Sections 5 and 6 of 1A2S7 and 1A2S8 select options for the indicators. Figure 4—3B shows the location of these switches and provides a table used to select the appropriate switch settings.

4.21 VF SWITCHING SUMMARY.

4.22 Table 4—4 summarizes voice-frequency switching in the TTS59C. The table presents the major VF applications along with related switch positions and important circuit connections. The DROP/THRU/LINE switch, the TMS/THRU/SEND OSC switch, and the DIAL + TALK 2W/KEY PULSE/TALK 4W switch controls the connection of inputs from J2, J3/J4, J7, J9, J11, and J12 and outputs J3/J4, J7, J8, J10, and J11. The terms "feeds" and "gets" in the jack columns relate to internal connections only. For example, J12 is connected through the unit to J10 to monitor four-wire VF signals from the line. The table will clarify many questions about the test set operation, especially those regarding the monitor function.

4.23 The terms CHAN A and CHAN B are nothing more than convenient definitions of internal functional connection points. The signals named under these headings are combined before connection to the external headset receiver. The prefix KP is a reminder that the DIAL + TALK 2W/KEY PULSE/TALK 4W switch must be in the KEY PULSE position to hear the designated tones. The signals under TALK OP'S are heard with this switch in either DIAL + TALK 2W or TALK 4W.

4.24 The table reveals general characteristics of the named switches and jacks as follows.

1. Completion of the headset transmitter and in-band tone signaling circuits requires that the TMS/THRU/SEND OSC switch be in the THRU position.

2. The telephone headset transmitter is not enabled when the DIAL + TALK 2W/KEY PULSE/TALK 4W switch is in the KEY PULSE position.

3. In-band tone signaling is enabled only with the DIAL + TALK 2W/KEY PULSE/TALK 4W switch in the KEY PULSE position.

4. From 2 and 3 above, it is seen that the transmitter and in-band tone signals are not mixed.

5. The monitor is never disabled.

6. No signal generated internally or by auxiliary instruments such as a TMS or an oscillator can be connected to the line and drop circuits when the DROP/THRU/LINE switch is at THRU.

7. Quiet, blocked, 600-ohm terminations are connected to the LINE SEND and REC jacks when the DROP/THRU/LINE switch is at DROP and to DROP SEND and REC jacks with this switch at LINE.

The table obscures the fact that any operation which can be done toward the line can also be done toward the drop. Certain operations toward the drop are not expected to be used and are thus not described in the table.

4.25 OUTPUT LEVELS.

4.26 Table 4—6 lists the TTS59C output levels into drop and line sides of circuits under test. The milliwatt signal is an output derived from an external oscillator connected to J2 or J7. Signals from such external units should be set at +7 dBm. Pads in the TTS59C are switched to produce appropriate levels into drop and line directions on two-wire or four-wire circuits. The other output types (SF, MF, and TT) are generated within the TTS59C. The 16-dB pad associated with sending toward the line on four-wire circuits is inserted only when the DROP/THRU/LINE switch is at LINE and a plug is inserted into the LINE REC 4W jack. This arrangement avoids inadvertent insertion of the pad in:

(1.) the line direction on two-wire circuits, and

(2.) any drop circuit.

4.27 GENERAL OPERATING SEQUENCE.

4.28 After selecting the appropriate patching scheme, the general procedure is much like operating a telephone set, but with provisions for using accessory instruments. These instruments can be used to insert known test levels into a circuit under test, as desired. Similar instruments located at the far end can be used to meaure received levels. The general sequence illustrated in Figure 4—4 is as follows.

1. Prepare circuit under test, the TTS59C, and any auxiliary test sets.

a. Patch 48-volt supply to TTS59C and to auxiliary instruments.

b. Connect telephone set and auxiliary instruments to the TTS59C if required.

c. Initialize TTS59C controls.

d. Apply power to all units.

e. Patch circuit under test to the TTS59C.

2. Test busy status of circuit under test.

3. Seize circuit by signaling off-hook to the far end.

4. When far end is ready, send addressing signaling as required.

5. When far end goes off-hook (answers), commence transmission or other testing as desired using auxiliary instruments.

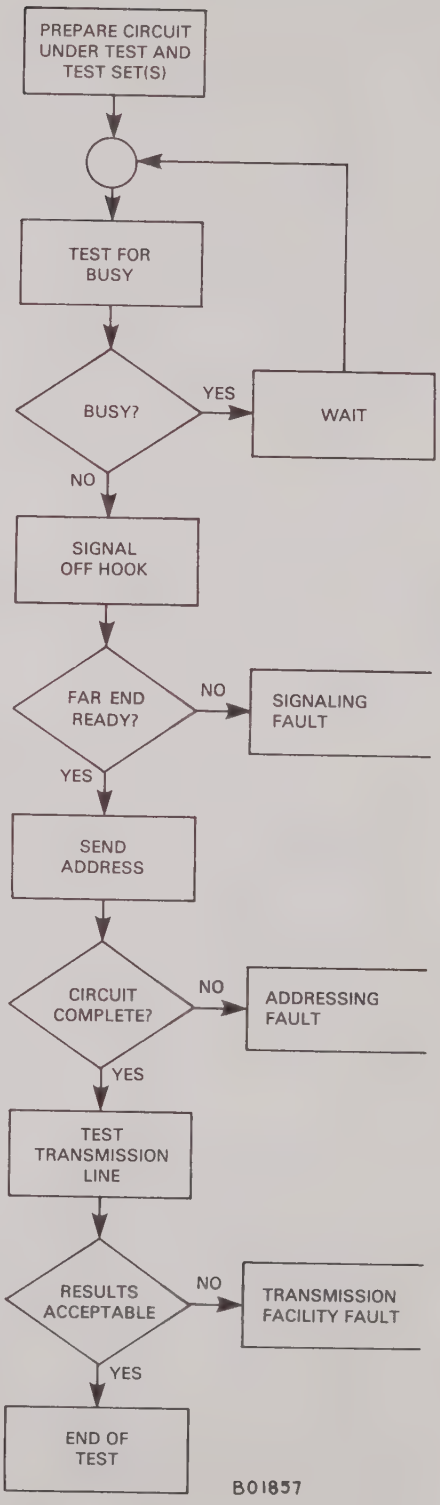


Figure 4—4. TTS59C General Sequence of Operation.

4.29 **CONFIDENCE TESTS.**

4.30 Confidence in the operating condition of the unit is normally gained during routine operation by use of the VF monitor function. Table 4—4 shows that monitor inputs include in-band supervisory and address signaling tones, external oscillator signals, TMS test signals, and two-wire transmitter signals. Other test set functions can be checked using the procedures that follow.

4.31 FOUR-WIRE TALK CONFIDENCE TEST.

4.32 Connection of the headset transmitter to the LINE and DROP SEND jacks and connection of the LINE and DROP REC jacks to the monitor in four-wire talk operation is checked as follows.

1. Connect central office battery source to the 48V jack.

2. Connect a type 52A telephone headset to the TEL SET jacks.

3. Set POWER switch at ON.

4. Set DIAL + TALK 2W/KEY PULSE/TALK 4W switch at TALK 4W.

5. Set DROP/THRU/LINE switch at DROP.

6. Set all other lever switches at their center position.

7. Patch DROP SEND jack to DROP REC jack.

8. Voice should be heard in the headset when speaking into the transmitter.

9. Remove patch from DROP SEND-DROP REC jacks.

10. Patch LINE REC jack to LINE SEND jack.

11. Set DROP/THRU/LINE switch at LINE.

12. Voice should be heard in the headset when speaking into the transmitter. The level will be lower than that heard from the drop circuit.

4.33 E&M CONFIDENCE TESTS.

4.34 The E&M functions are tested as follows.

NOTE

This test applies only when the E&M sending function uses protected battery.

1. Connect central office battery source to the 48V jack.

2. Set POWER switch at on.

3. Set both E&M switches at ON HK.

4. Set all other lever switches at their center position.

5. Patch E&M LINE jack to E&M DROP jack.

6. If the unit is programmed for lighted E&M indicators during the idle state, both E&M indicators should be lighted. (Both indicators will be off if the unit is internally programmed for dark indicators during the idle state. See paragraph 4.20.)

7. Set both E&M switches at OFF HK.

8. The E&M indicators should change state from that observed in step 6.

9. Set DIAL L/CENTER/DIAL D switch at DIAL D.

10. Latch DP pushbutton.

11. Press any keypad numeral. The E&M TWD D indicator should flash.

12. Set DIAL L/CENTER/DIAL D switch at DIAL D.

13. Set both E&M switches at THRU, then return to OFF HK.

14. Press REDIAL pushbutton. The E&M TWD L indicator should flash.

4.35 PAD CONFIDENCE TESTS.

4.36 If difficulties are encountered when using the unit in conjunction with auxiliary instruments and when the circuit under test is felt to be trouble-free, the internal pads can be tested as follows.

1. Connect central office battery source to the 48V jack.

2. Set POWER switch at ON.

3. Set DROP/THRU/LINE switch at DROP.

4. Set TMS/THRU/SEND OSC switch at TMS.

5. Set all other lever switches at their center postion.

6. Patch DROP SEND jack to DROP REC jack.

7. Connect TMS instrument to TMS SEND and REC jacks.

8. Measure the level present at the TMS REC jack. It should be within 1 dB of that level applied to the TMS SEND jack.

9. Latch the SF pushbutton. The level measured at the TMS REC jack should drop 16 ±1 dB.

10. Release the SF pushbutton.

11. Set DROP/THRU/LINE switch at LINE.

12. Transfer patch to LINE SEND and REC jacks.

13. The level measured at the TMS REC jack should be 23 ±1 dB below that measured in step 8.

4.37 OPERATING PROCEDURES.

4.38 Paragraphs 4.41 through 4.68 contain detailed operating procedures. Paragraph 4.39 is particularly important in that adherence to this sequence simplifies test set operation and helps avoid operating errors. All of the test procedures are illustrated. Each illustration shows the connection of the test set to the circuit under test, the basic signal flow within the set, and applicable controls. The tip and ring connections are not shown separately but are represented by a single flow line. Lines between controls and blocks show major control functions. Heavy accenting lines around button-type controls serve to identify those controls applicable to the test illustrated. Heavy dashed lines indicate controls used following a step involving those with heavy solid lines. The procedures for supervision and address signaling link to other procedures involving auxiliary instruments, which are not affected by the mode of supervision and addressing.

4.39 Select the procedure (or procedures) required to execute the desired test (one supervision and addressing procedure and, if necessary, one procedure for using auxiliary instrumentation). First, connect power. Then, connect telephone headset and auxiliary instruments if required. Energize auxiliary instruments. Make initial switch settings. Energize test set. Connect test set to circuit under test via patch bay. These preparatory steps are detailed in each supervisory and addressing procedure. No preparatory actions are required between linking procedures.

4.40 If a test is interrupted, the circuit under test can be patched through without disconnecting any patch cords by setting the DROP/THRU/LINE switch at THRU, and the E&M TWD D and TWD L switches at THRU and the DIAL L/CENTER/DIAL D switch at its center position.

4.41 TWO-WIRE CIRCUIT SUPERVISION AND ADDRESSING PROCEDURES.

4.42 Paragraphs 4.43 through 4.54 provide instructions to supervise, address, and talk on two-wire circuits.

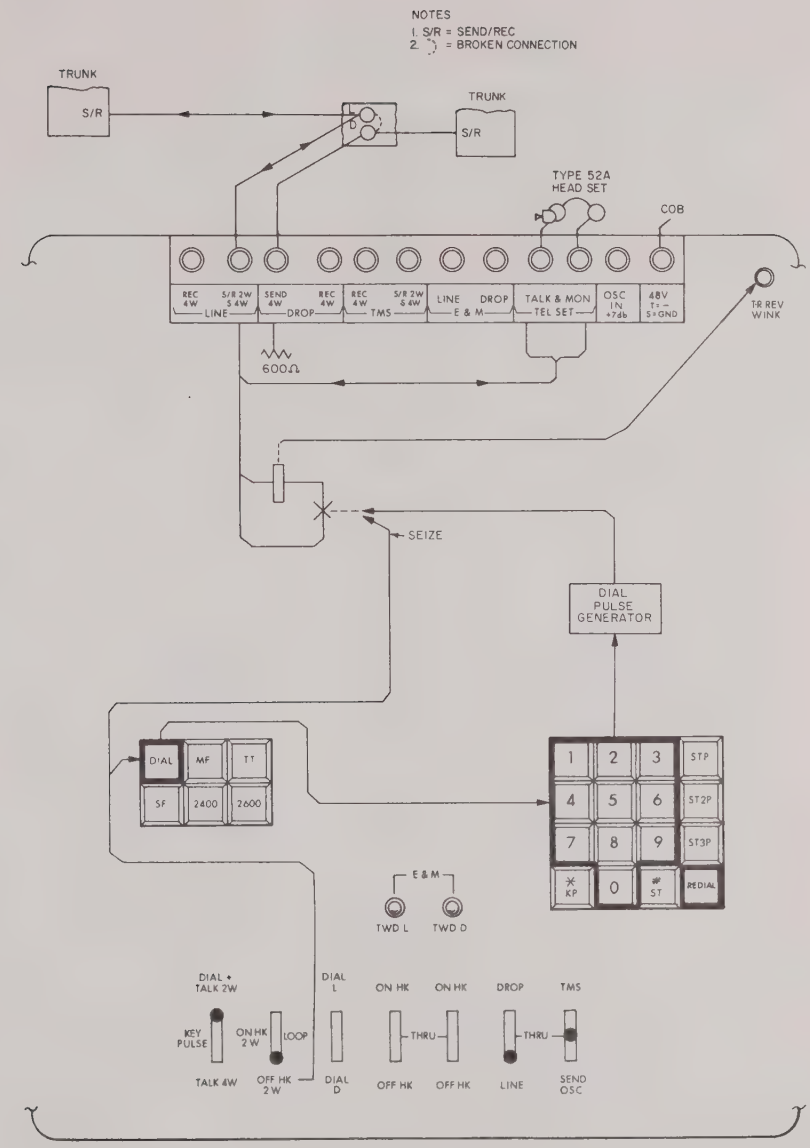


Figure 4—5. Supervise, Dial Pulse, and Talk on Loop Toward Line.

4.43 **Supervise, Dial pulse, and Talk on Loop Circuits.**

4.44 Supervising, dialing, and talking on a loop toward the line is illustrated in Figure 4—5. (The talk function is summarized as item 1 in Table 4—4). Figure 4—6 shows the same operating sequence toward the drop, which is the same except for the setting of the DROP/THRU/LINE switch and patching of the DROP SEND jack. To supervise, dial pulse and talk on loop circuits, perform the following steps.

1. Connect central office battery source to the 48V jack.

2. Connect auxiliary instrument to the test set and energize the auxiliary instruments if required.

3. Connect a type 52A telephone headset to the TEL SET jacks if required.

4. Release all pushbuttons in the six-button array.

5. Set all lever switches at their center position.

6. Set DIAL + TALK 2W/KEY PULSE/TALK 4W switch at DIAL + TALK 2W.

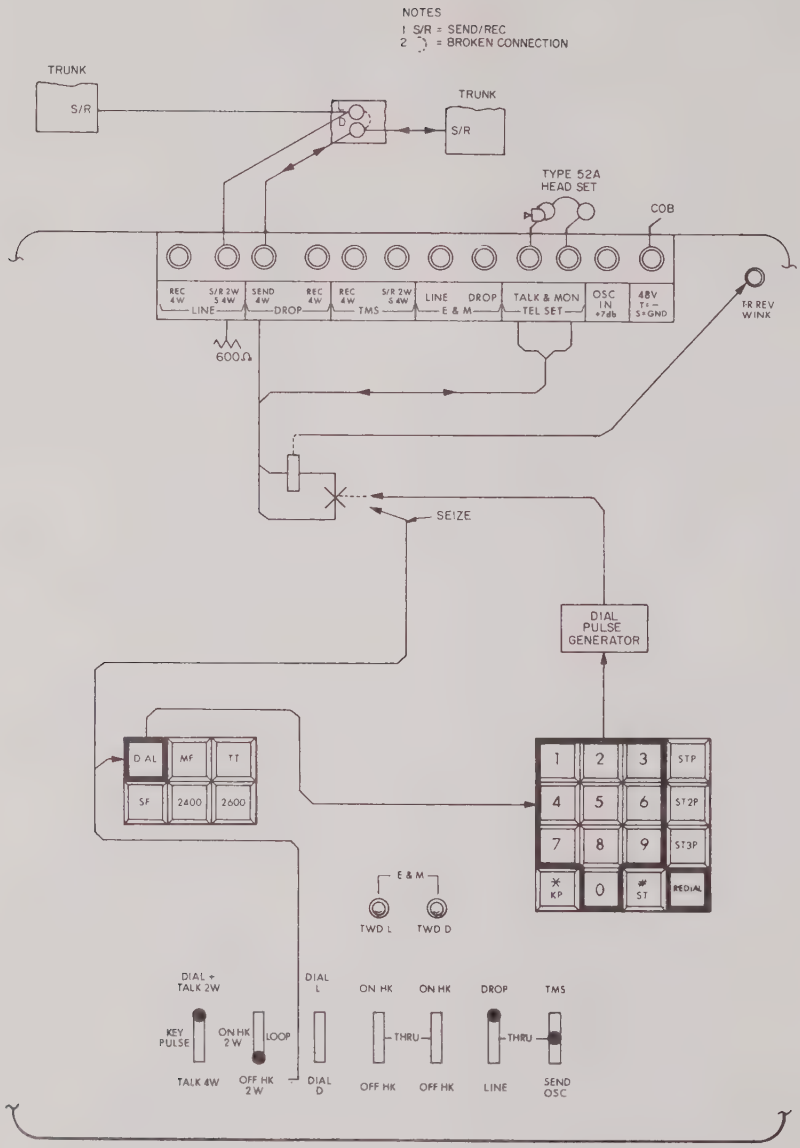


Figure 4—6. Supervise, Dial Pulse, and Talk on Loop Toward Drop.

7. Set DROP/THRU/LINE switch at LINE or DROP as required.

8. Set POWER switch at ON.

9. Connect the test set to the patch bay as shown in either Figure 4—5 or Figure 4—6 as required.

10. Set LOOP ON HK 2W/OFF HK 2W switch at OFF HK 2W.

11. Wait for T-R REV (WINK) indication if necessary.

12. Latch DP pushbutton.

13. Use keypad numerals to address the loop.

14. To use the redial feature, first momentarily set LOOP ON HK 2W/OFF HK 2W switch at ON HK 2W and return to OFF HK 2W. Then press REDIAL pushbutton.

15. The circuit is ready for communication when the called number answers.

16. See paragraphs 4.55 and 4.57 for other operations possible at this point in the test.

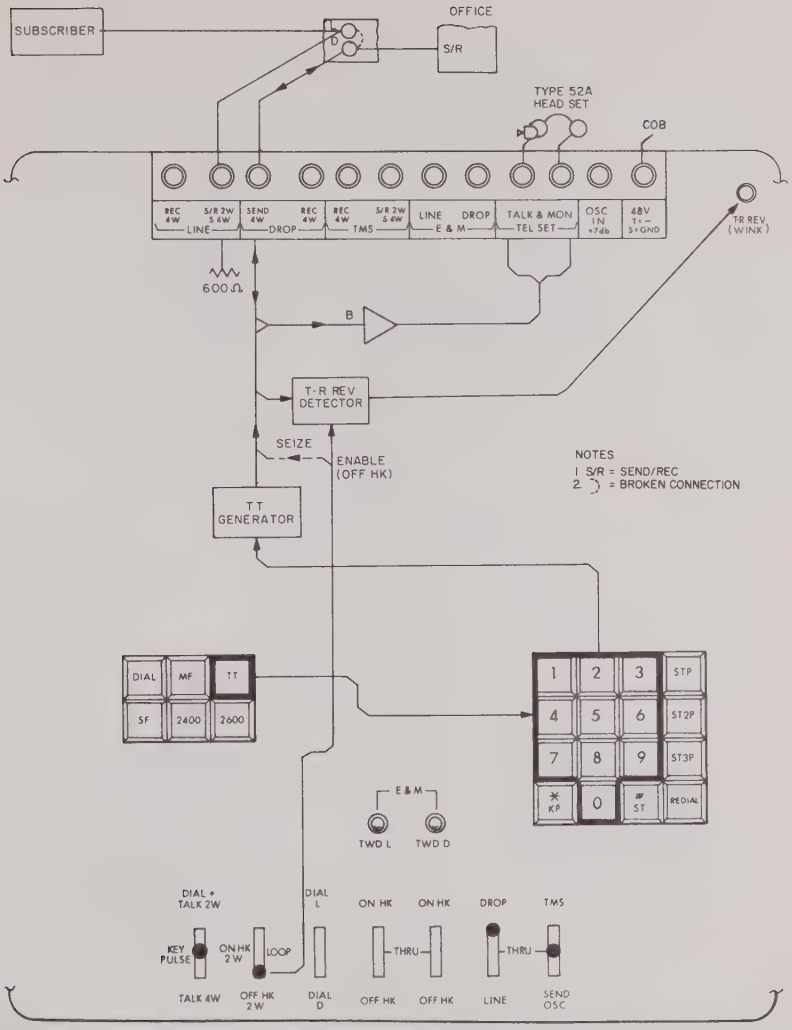


Figure 4—7. Supervision on Loop Toward Drop With TT Addressing.

4.45 **Supervision on Loop Circuit Toward the Drop with TT Addressing.**

4.46 Supervising on a loop circuit toward the drop and use of TT addressing is shown on Figure 4—7 and outlined in the following steps. (In-band tone signaling on a loop toward the drop is summarized as item 6 in Table 4—4).

1. Connect central office battery source to the 48V jack.

2. Connect auxiliary instrument to the test set and energize the auxiliary instrument if required.

3. Connect a type 52A telephone headset to the TEL SET jacks if required.

4. Release all pushbuttons in the six-button array.

5. Set all lever switches at their center position.

6. Set DROP/THRU/LINE switch at DROP.

7. Connect the unit to the patch bay as shown on Figure 4—7.

8. Set POWER switch at ON.

9. Set LOOP ON HK 2W/OFF HK 2W switch at OFF HK 2W.

10. Wait for T-R REV (WINK) indication if necessary.

11. Latch TT pushbutton.

12. Use the keypad numerals to address the loop.

13. Communications can be established by setting the DIAL + TALK 2W/KEY PULSE/TALK 4W switch at DIAL + TALK 2W.

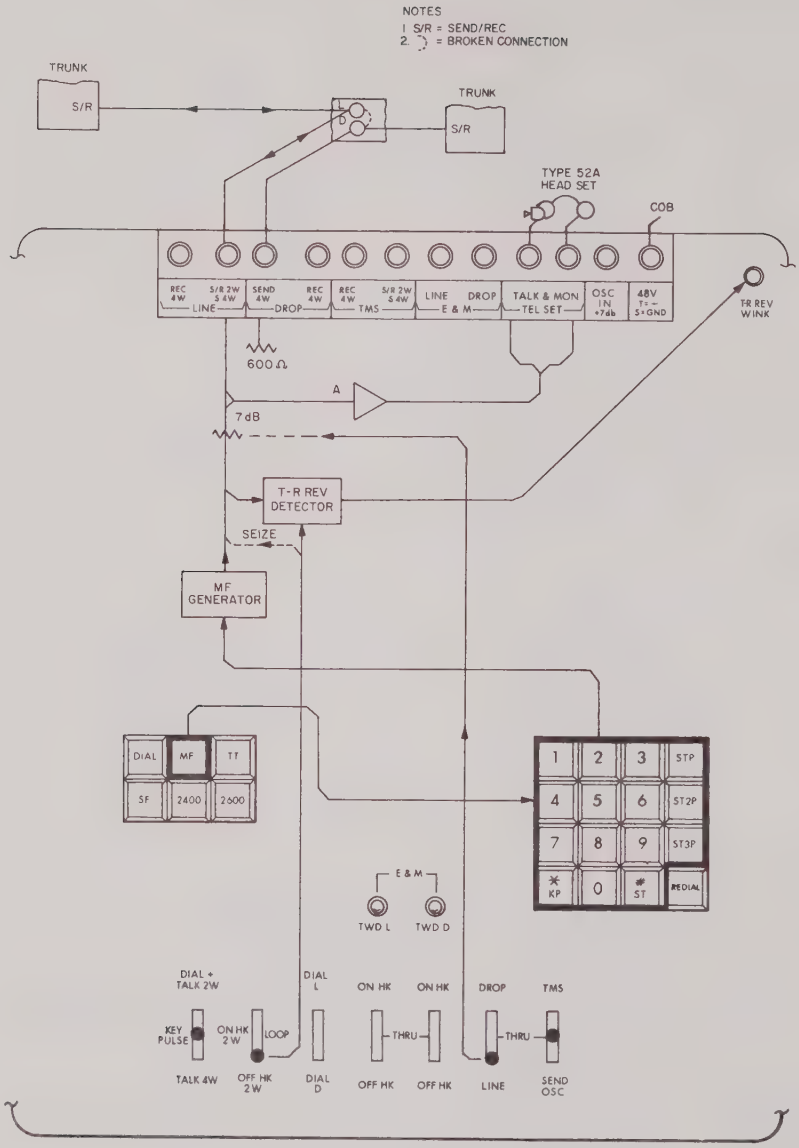


Figure 4—8. Supervision on Loop Toward Line With MF Addressing.

4.47 **Supervision on Loop Circuit Using MF Addressing.**

4.48 The supervisory operations on a loop circuit using MF addressing toward the line are shown on Figure 4—8, toward the drop on Figure 4—9, and presented in the following steps. (In-band tone signaling on a loop circuit is summarized as items 4 and 6 in Table 4—4).

1. Connect central office battery source to the 48V jack.

2. Connect auxiliary instruments to the test set and energize auxiliary instruments if required.

3. Connect a type 52A telephone headset to the TEL SET jacks if required.

4. Release all pushbuttons in the six-button array.

5. Set all lever switches at their center position.

6. Set DROP/THRU/LINE switch at LINE or DROP as required.

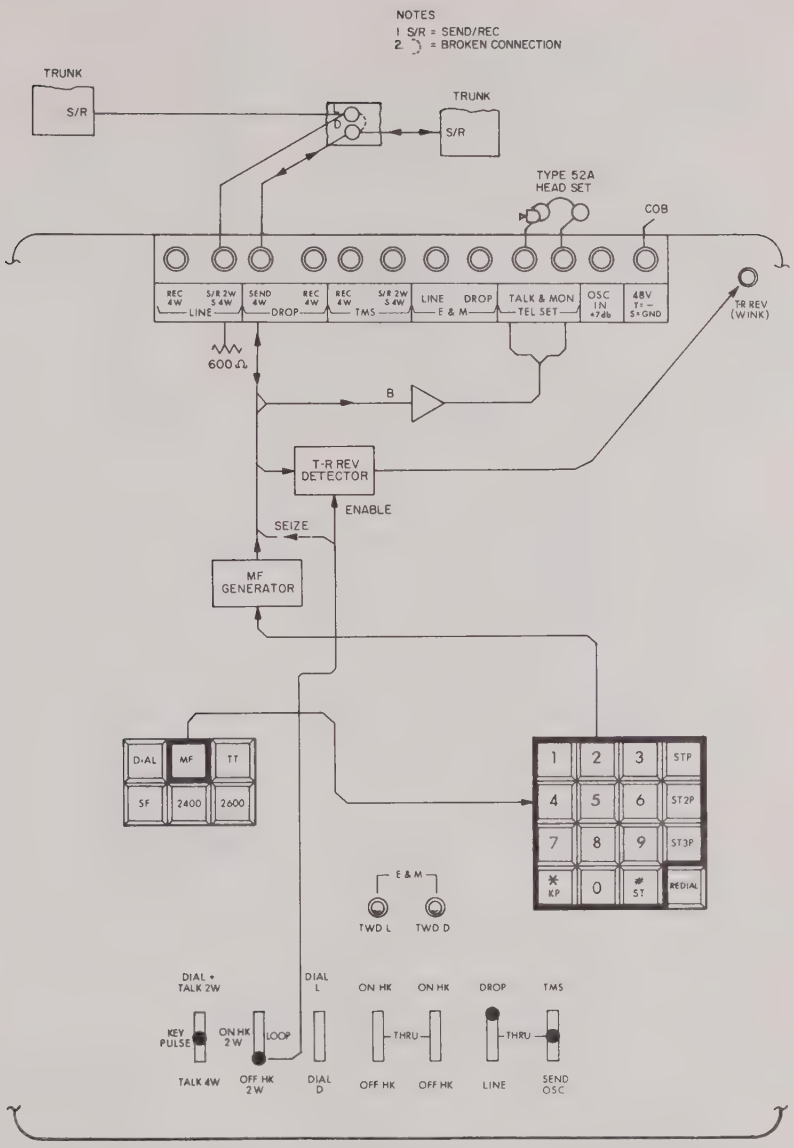


Figure 4—9. Supervision on Loop Toward Drop with MF Addressing.

7. Connect test set to the patch bay as shown in Figures 4—8 or 4—9 as required.

8. Set POWER switch at ON.

9. Set LOOP ON HK 2W/OFF HK 2W switch at OFF HK 2W.

10. Latch MF pushbutton.

12. Use the keypad numerals to address the loop.

13. Communications can be established by setting the DIAL + TALK 2W/KEY PULSE/TALK 4W switch at DIAL + TALK 2W.

14. See paragraphs 4.55 and 4.57 for other operations that can be performed at this point in the procedure.

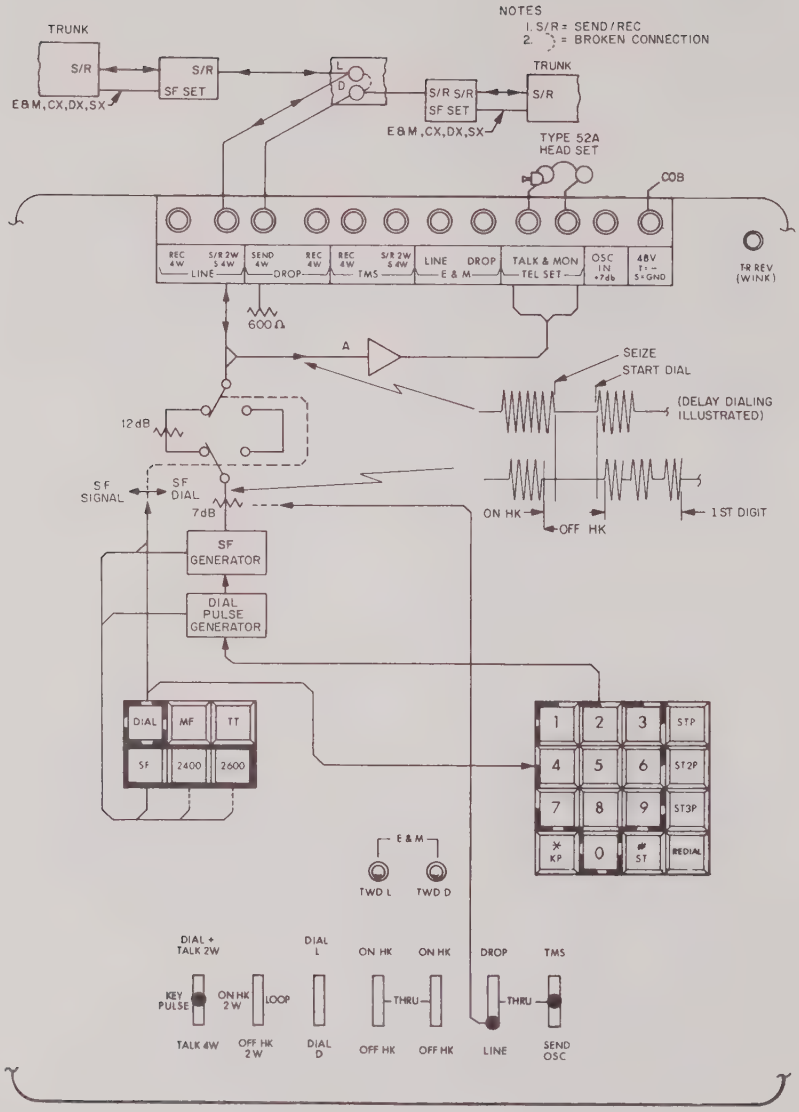


Figure 4—10. SF Supervision and Addressing on Two-Wire Circuit Toward Line.

4.49 **SF Supervision and Addressing on a Two-Wire Circuit.**

4.50 Two-wire circuit SF supervision and addressing operations are shown on Figures 4—10 and 4—11 and presented in the following steps. Figure 4—10 shows the operation toward the line and Figure 4—11 toward the drop. (In-band tone signaling on a two-wire circuit is summarized as items 4 and 6 in Table 4—4).

1. Connect central office battery souce to the 48V jack.

2. Connect auxiliary instrument to the test set and energize auxiliary instrument if required.

3. Connect a type 52A telephone headset to the TEL SET jacks if required.

4. Release all pushbuttons in the six-button array.

5. Set all lever switches at their center position.

6. Latch the SF pushbutton.

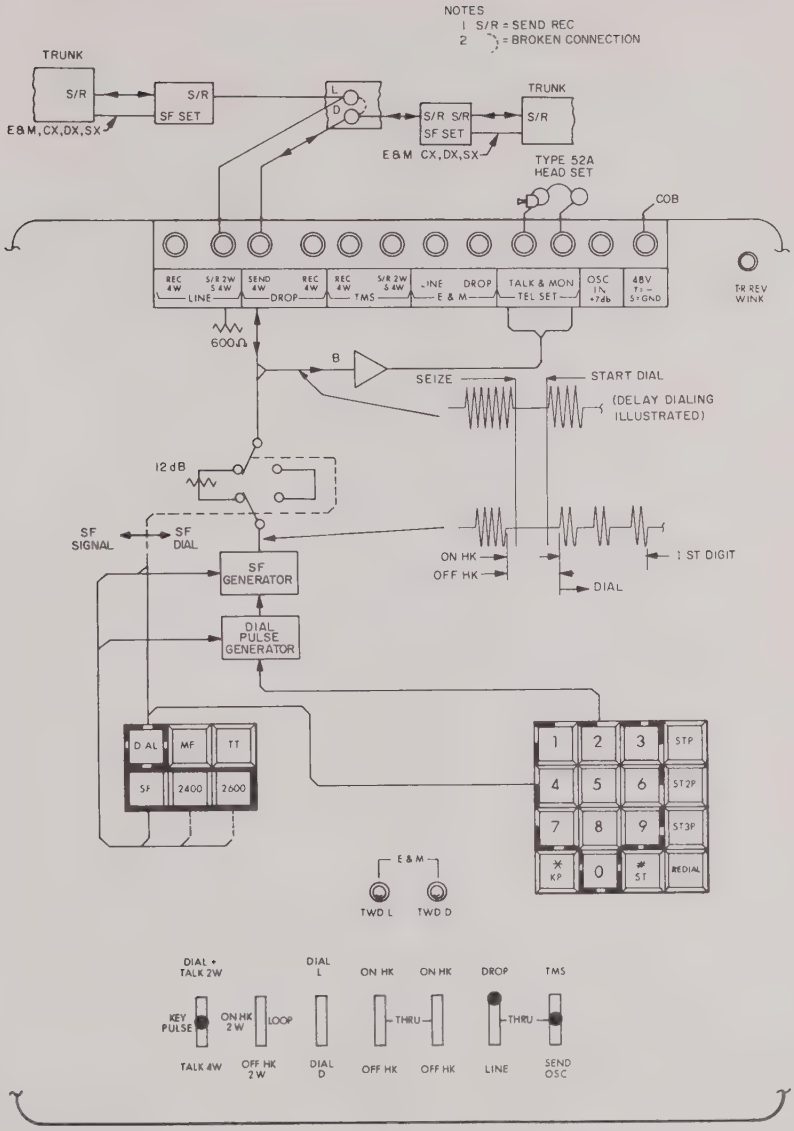


Figure 4—11. SF Supervision and Addressing on Two-Wire Circuit Toward Drop.

7. Latch either the 2400 or 2600 pushbutton as required.

8. Set DROP/THRU/LINE switch at LINE or DROP as required.

9. Set POWER switch at ON.

10. Connect the unit to the patch bay as shown on Figures 4—10 or 4—11 as required.

11. Latch the DP pushbutton.

12. Wait for a VF indication that the far end is ready to accept addressing.

13. Address the circuit by pressing the numeral pushbuttons on the keypad.

14. Communication on the circuit can be established by setting DIAL + TALK 2W/KEY PULSE/TALK 4W switch at DIAL + TALK 2W.

15. See paragraphs 4.55 and 4.57 for other operations that are possible at this point in the test.

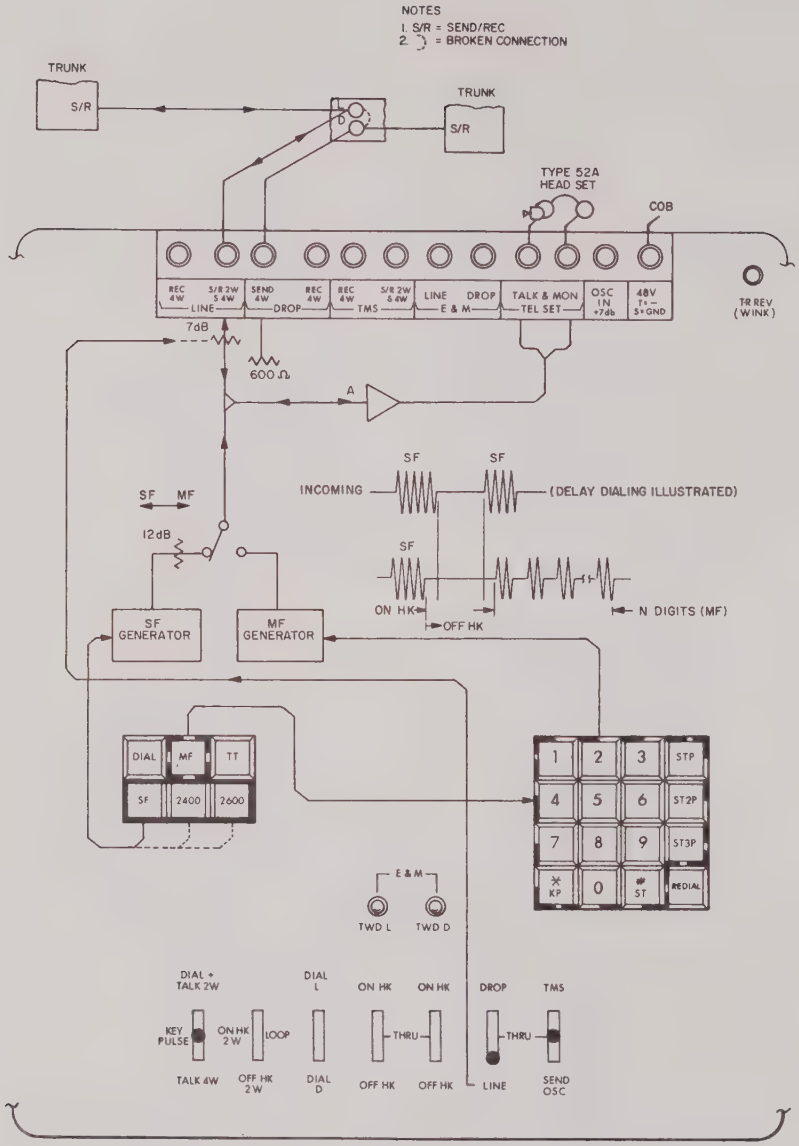


Figure 4—12. SF Supervision and MF Addressing on Two-Wire Circuit Toward Line.

4.51 **SF Supervision and MF Addressing on a Two-Wire Circuit.**

4.52 Figure 4—12 shows this application as used toward the line and Figure 4—13 as toward the drop and are presented in the following steps. (In-band tone signaling conditions for two-wire circuits are summarized as items 4 and 6 in Table 4—4.)

1. Connect central office battery source to the 48V jack.

2. Connect auxiliary instrument to the test set and energize auxiliary instrument if required.

3. Connect a type 52A telephone headset to the TEL SET jacks if required.

4. Release all pushbuttons in the six-button array.

5. Set all lever switches at their center position.

6. Latch the SF pushbutton.

7. Latch either the 2400 or 2600 pushbutton as required.

8. Set DROP/THRU/LINE switch at LINE or DROP as required.

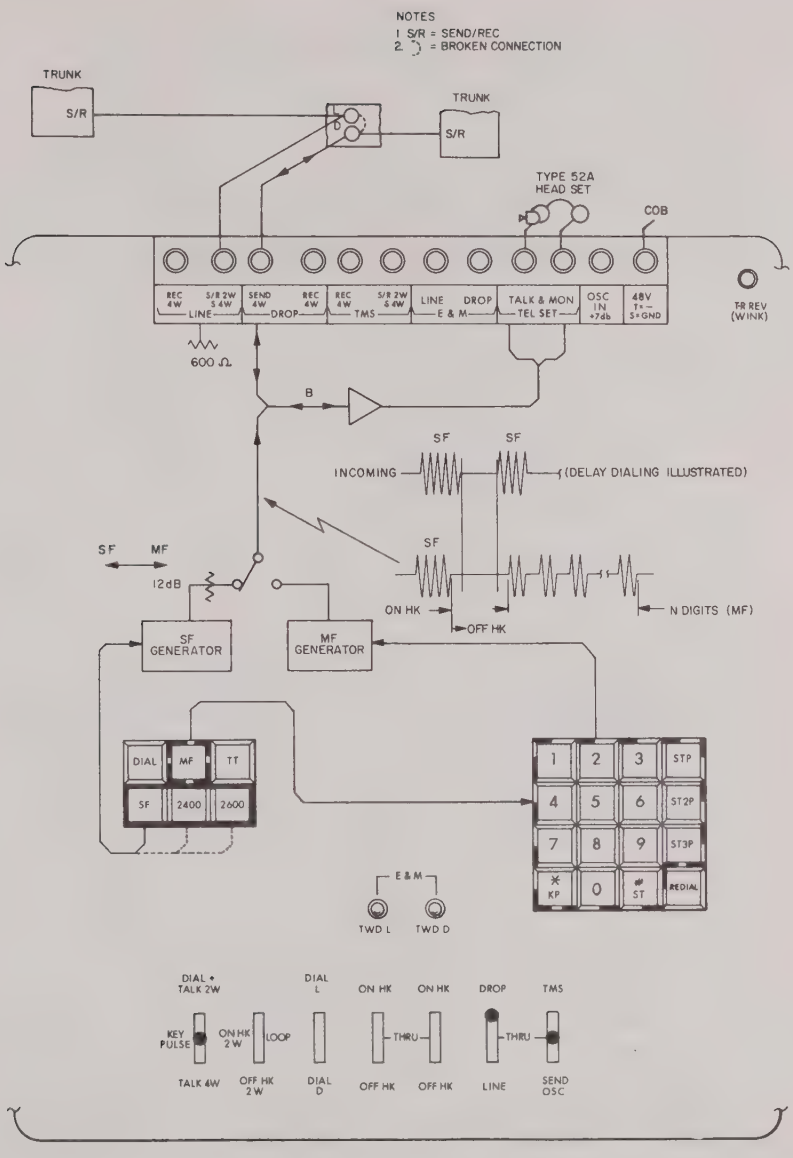


Figure 4—13. SF Supervision and MF Addressing on Two-Wire Circuit Toward Drop.

9. Set POWER switch at ON.

10. Connect the unit to the patch bay as shown in Figures 4—12 or 4—13 as required.

11. Release the pushbuttons in the six-button array.

12. Wait for VF indication that the far end is ready to receive addressing.

13. Latch the MF pushbutton.

14. Use the numerals on the keypad to address the circuit.

15. Communication can be established by setting the DIAL + TALK 2W/KEY PULSE/TALK 4W switch at DIAL + TALK 2W.

16. See paragraphs 4.55 and 4.57 for other operations that can be used at this point in the procedure.

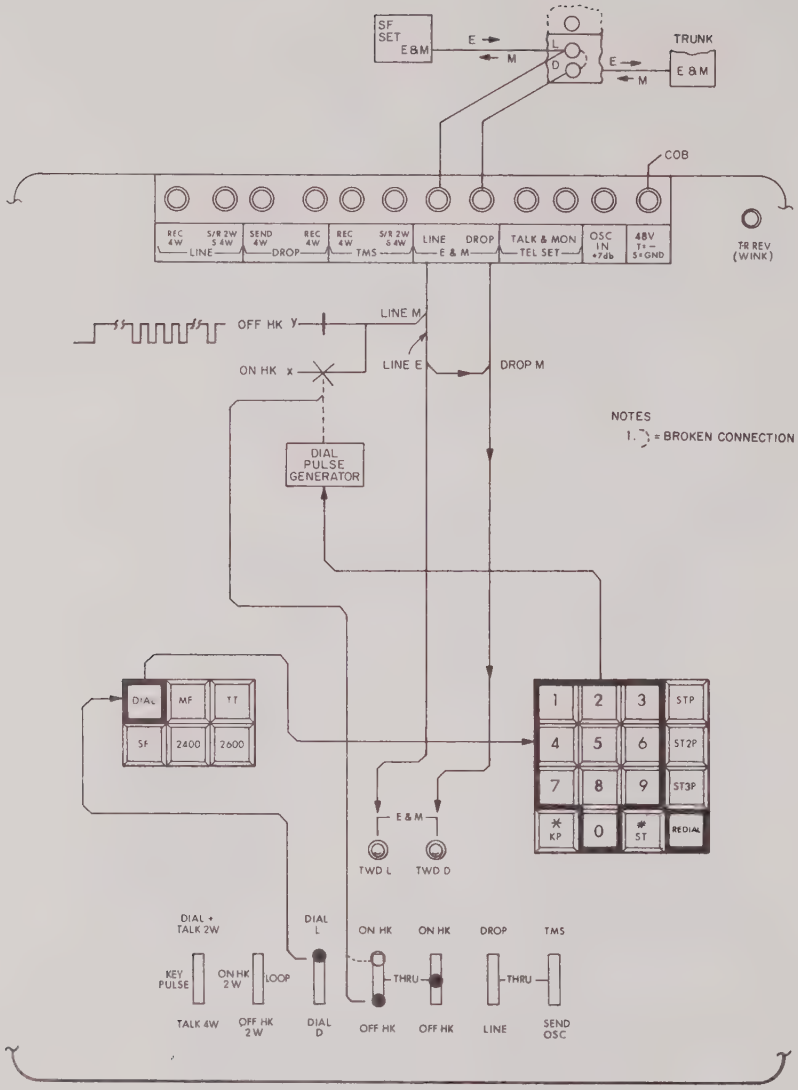


Figure 4—14. Supervising and Addressing E&M Toward Line.

4.53 **E&M Supervision and Addressing on Two-Wire and Four-Wire Circuits.**

4.54 Supervision and addressing operations on two-wire and four-wire E&M circuits are illustrated by Figures 4—14 and 4—15 and presented in the following steps. To operate toward the line, use Figure 4—14. Operation toward the drop is shown on Figure 4—15.

NOTE

Before starting this procedure, ensure that internal E&M programming has been set to meet the conditions expected to be found on the circuit under test.

1. Connect central office battery source to the 48V jack.

2. Connect auxiliary instrument to the test set and energize auxiliary instrument if required.

3. Release all pushbuttons in the six-button array.

4. Set all lever switches at their center position.

5. Set POWER switch at ON.

6. Patch the E&M LINE and DROP jacks to the patch bay as required. See Figure 4—14 for operation toward the line and Figure 4—15 toward the drop.

7. Patch the VF jacks as required by testing to be done after addressing.

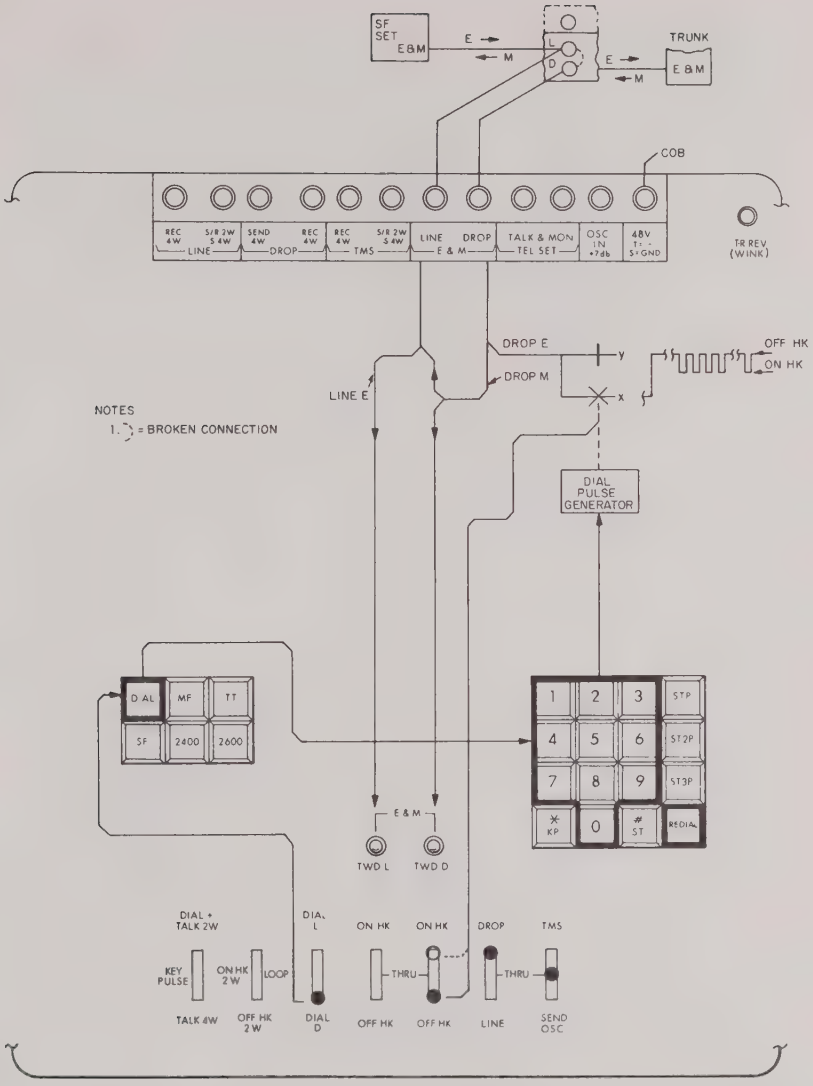


Figure 4—15. Supervising and Addressing E&M Toward Drop.

8. If the circuit is idle, set E&M TWD L or TWD D ON HK/THRU/OFF HK switch at OFF HK as required.

9. Wait for indication on TWD L or TWD D lamp that the far end is ready to receive addressing.

NOTE

If an indication is not received, the received voltage may not be sufficient to trip the threshold circuits.

10. Set DIAL L/CENTER/DIAL D switch at DIAL L or DIAL D as required.

11. Latch the DP pushbutton.

12. Use the keypad numerals to address the circuit.

13. To use the redial feature, first momentarily set LOOP ON HK 2W/OFF HK 2W switch at ON HK 2W and return to OFF HK 2W. Then press the REDIAL pushbutton.

14. When the connection has been established, the TMS and oscillator operation described in paragraphs 4.55, 4.57, 4.65, or 4.67 can now be accomplished. In addition, communication can be established by setting the DIAL + TALK 2W/ KEY PULSE/TALK 4W switch at the appropriate TALK position.

15. Upon completion of testing, the circuit can be released by setting the E&M TWD L or TWD D ON HK/THRU/OFF HK switch at ON HK.

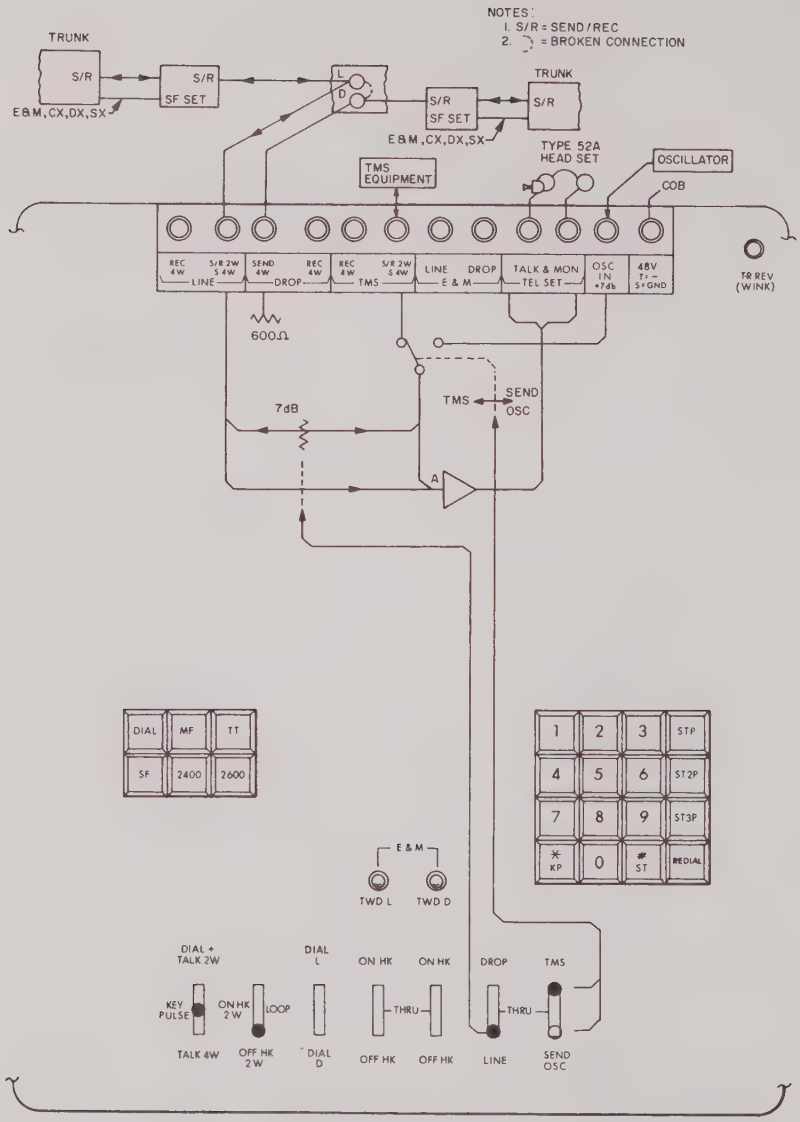


Figure 4—16. TMS and Oscillator Operations on Two-Wire Circuit Toward Line.

4.55 EXTERNAL TMS OPERATION ON TWO-WIRE CIRCUITS.

4.56 Operations using external TMS equipment are illustrated by Figures 4—16 and 4—17 for toward-the-line and toward-the-drop applications respectively and presented in the following steps. (Conditions are summarized as items 8 and 10 in Table 4—4). This procedure is linked with the two-wire supervision and addressing procedures presented in paragraphs 4.43 through 4.53.

1. Set up TMS equipment send and receive circuits.

2. Set DIAL + TALK 2W/KEY PULSE/TALK 4W switch at KEY PULSE.

3. Set TMS/THRU/SEND OSC switch at TMS.

4. Incoming milliwatt signals are now switched to the TMS instrument SEND jack. In addition, outgoing signals are routed to the LINE or DROP SEND jack.

5. To re-establish communications after testing, set the TMS/THRU/SEND OSC switch at THRU and the DIAL + TALK 2W/KEY PULSE/TALK 4W switch at DIAL + TALK 2W.

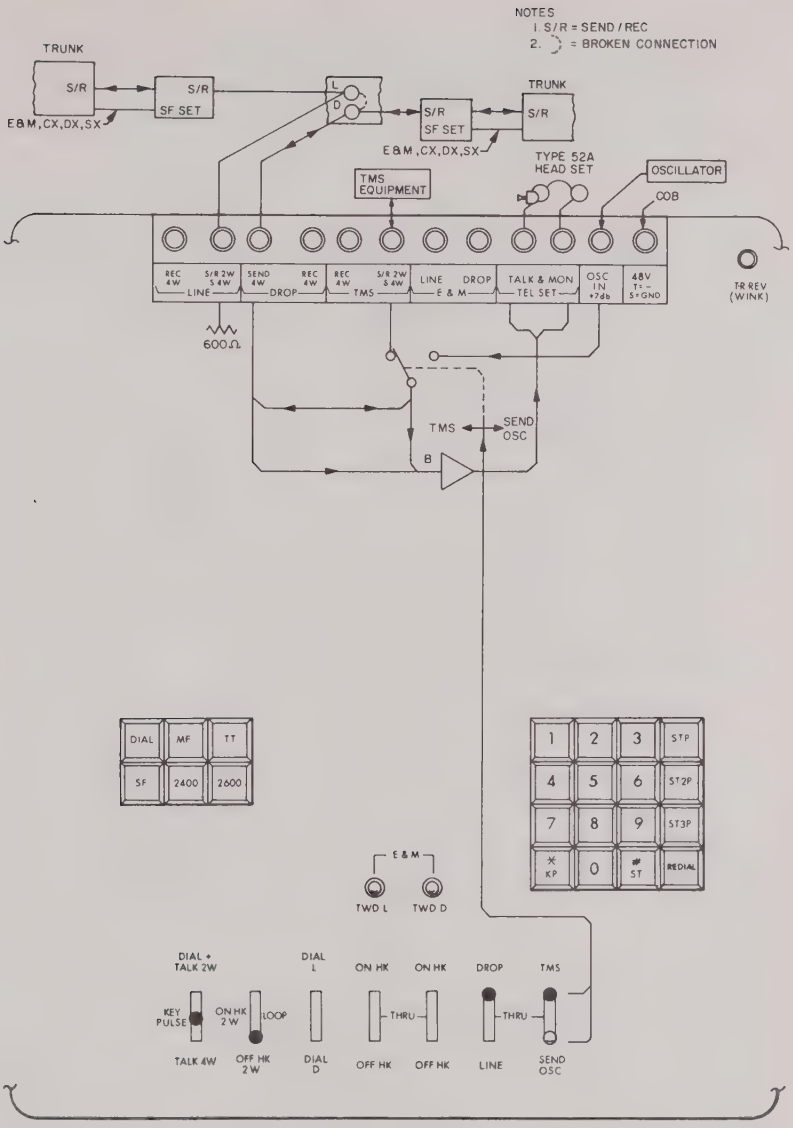


Figure 4—17. TMS and Oscillator Operations on Two-Wire Circuit Toward Drop.

4.57 EXTERNAL OSCILLATOR OPERATIONS ON TWO-WIRE CIRCUITS.

4.58 Operations involving inputs from an oscillator for application to two-wire circuits are illustrated in Figures 4—16 and 4—17 for toward-the-line and toward-the-drop applications respectively and presented in the following steps. (These operations are summarized as items 12 and 14 in Table 4—4). This procedure is linked with the two-wire supervision and addressing procedures presented in paragraphs 4.43 through 4.53.

1. Set oscillator output level at +7 dBm.

2. Set DIAL + TALK 2W/KEY PULSE/TALK 4W switch at KEY PULSE.

3. Set TMS/THRU/SEND OSC switch at SEND OSC.

4. The oscillator output is now routed to the LINE or DROP SEND jack. The level at these jacks is 0 dBm at the LINE and +7dBm at the DROP.

5. To re-establish communications after testing, set the TMS/THRU/SEND OSC switch at THRU and the DIAL + TALK 2W/KEY PULSE/TALK 4W switch at DIAL + TALK 2W.

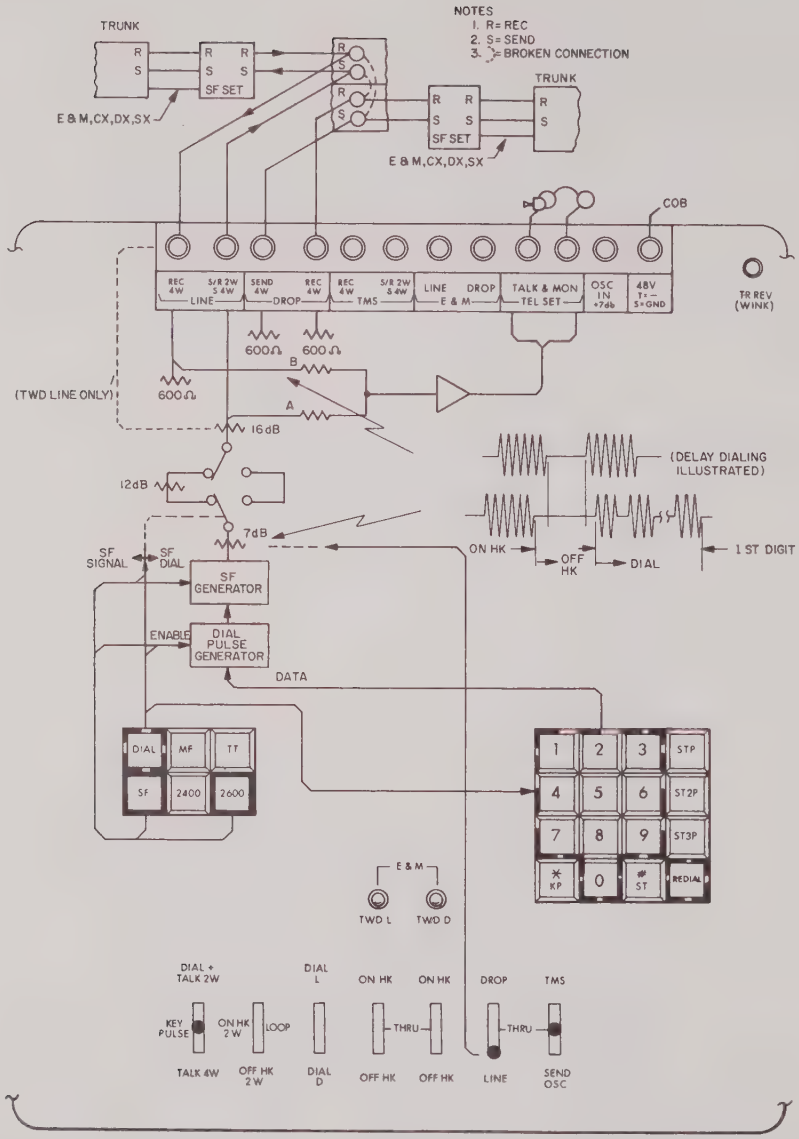


Figure 4—18. SF Supervision and Addressing on Four-Wire Circuit Toward Line.

4.59 FOUR—WIRE CIRCUIT SUPERVISION AND ADDRESSING PROCEDURES.

4.60 Paragraphs 4.61 through 4.68 provide instructions to supervise, address, and talk on four-wire circuits.

4.61 **SF Supervision and Addressing on a Four-Wire Circuit.**

4.62 These operations are illustrated in Figures 4—18 and 4—19 for toward-the-line and toward-the-drop applications respectively and presented in the following steps. (In-band tone signaling conditions on a four-wire circuit are summarized as items 5 and 7 in Table 4—4.

1. Connect central office battery source to the 48V jack.

2. Connect auxiliary instrument to the test set and energize auxiliary instrument if required.

3. Connect a type 52A telephone headset to the TEL SET jacks if required.

4. Release all pushbuttons in the six-button array.

5. Set all lever switches at their center position.

6. Latch both the SF and 2600 pushbuttons.

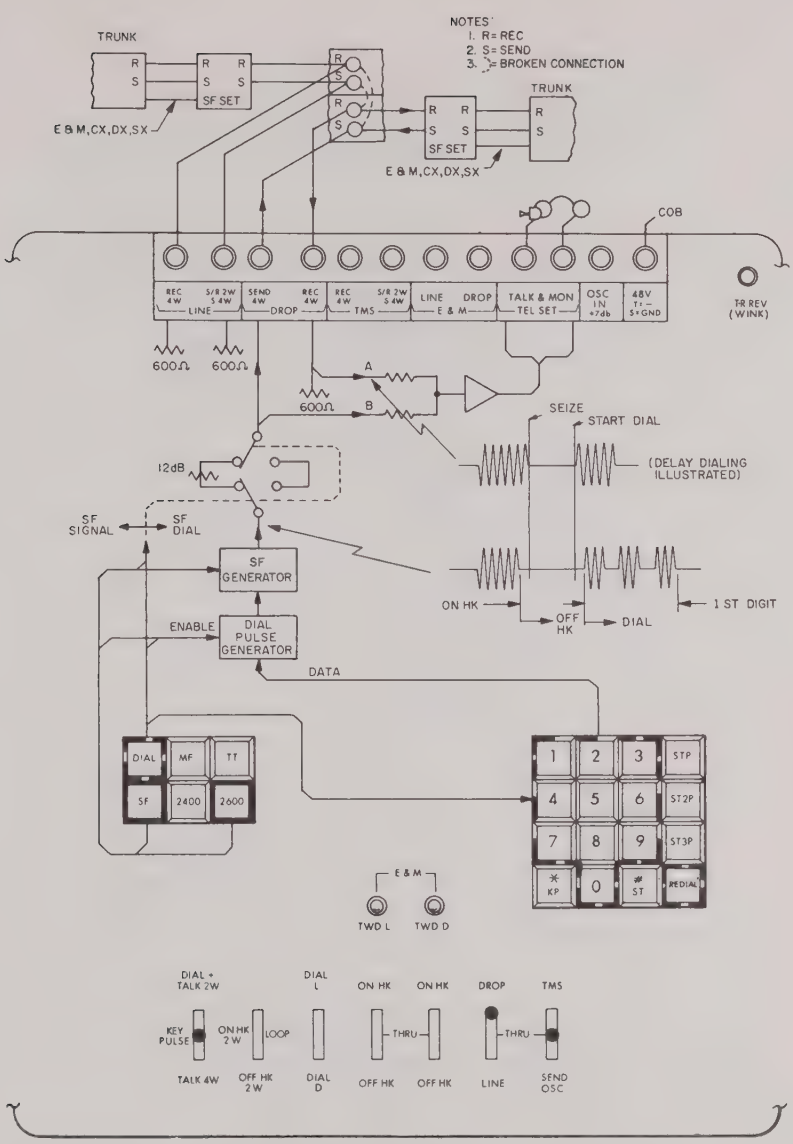


Figure 4—19. SF Supervision and Addressing on Four-Wire Circuit Toward Drop.

7. Set DROP/THRU/LINE switch at either LINE or DROP as required.

8. Set POWER switch at ON.

9. Connect the unit to the patch bay as shown in either Figure 4—18 or Figure 4—19 as required.

10. Signal off-hook by latching the DP pushbutton.

11. Wait for a VF indication that the far end is ready to receive addressing.

12. Use the keypad numerals to address the circuit.

13. Communications can be established by setting the DIAL + TALK 2W/KEY PULSE/TALK 4W switch at TALK 4W. Figures 4—22 and 4—23 show the operations for talking on four-wire circuits.

14. Refer to paragraphs 4.65 and 4.67 for additional procedures that can be performed at this point in the procedure.

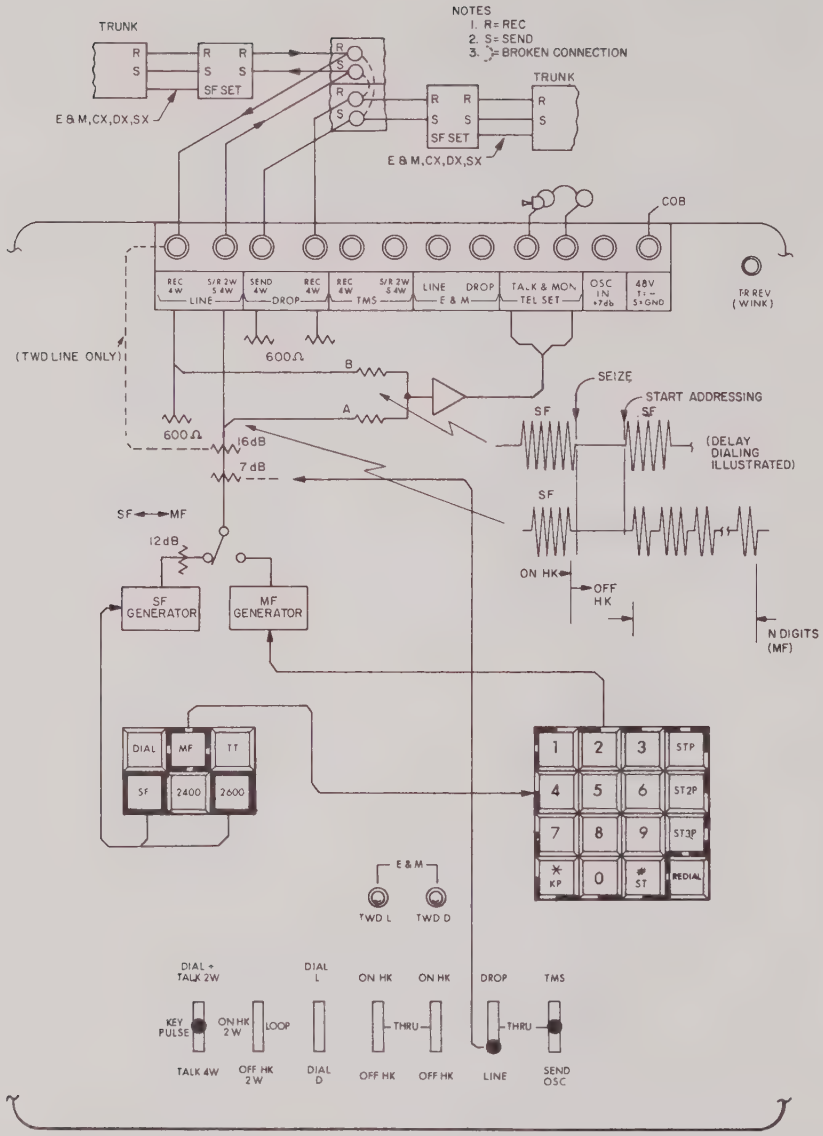


Figure 4—20. SF Supervision and MF Addressing on Four-Wire Circuit Toward Line.

4.63 **SF Supervision and MF Addressing on a Four-Wire Circuit.**

4.64 Operations for these functions are shown on Figures 4—20 and 4—21 for the line and drop applications respectively and presented in the following steps. (In-band tone signaling conditions on a four-wire circuit are summarized as items 5 and 7 in Table 4—4).

1. Connect central office battery source to the 48V jack.

2. Connect auxiliary instrument to the test set and energize auxiliary instrument if required.

3. Connect a type 52A telephone headset to the TEL SET jacks if required.

4. Release all pushbuttons in the six-button array.

5. Set all lever switches at their center position.

6. Latch both the SF and 2600 pushbuttons.

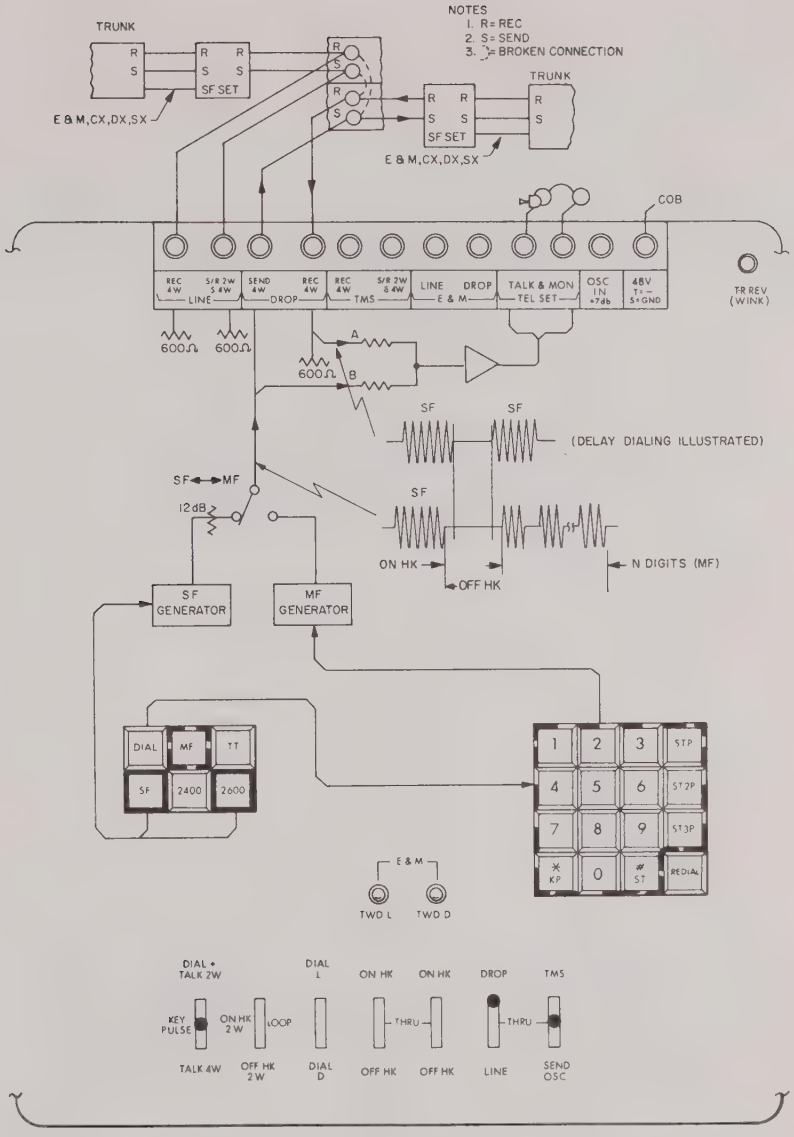


Figure 4—21. SF Supervision and MF Addressing on Four-Wire Circuit Toward Drop.

7. Set DROP/THRU/LINE switch at either LINE or DROP as required.

8. Set POWER switch at ON.

9. Connect the unit to the patch bay as shown on Figures 4—20 and 4—21 as required.

10. Signal off-hook by releasing both the SF and 2600 pushbuttons.

11. Wait for a VF indication that the far end is ready to receive addressing.

12. Latch the MF pushbutton.

13. Use the keypad numerals to address the circuit.

14. Communications can be established by setting the DIAL + TALK 2W/KEY PULSE/TALK 4W switch at TALK 4W. See Figures 4—23 and 4—24 for talking on four-wire circuits.

15. Refer to paragraphs 4.65 and 4.67 for additional procedures that can be performed at this point in the procedure.

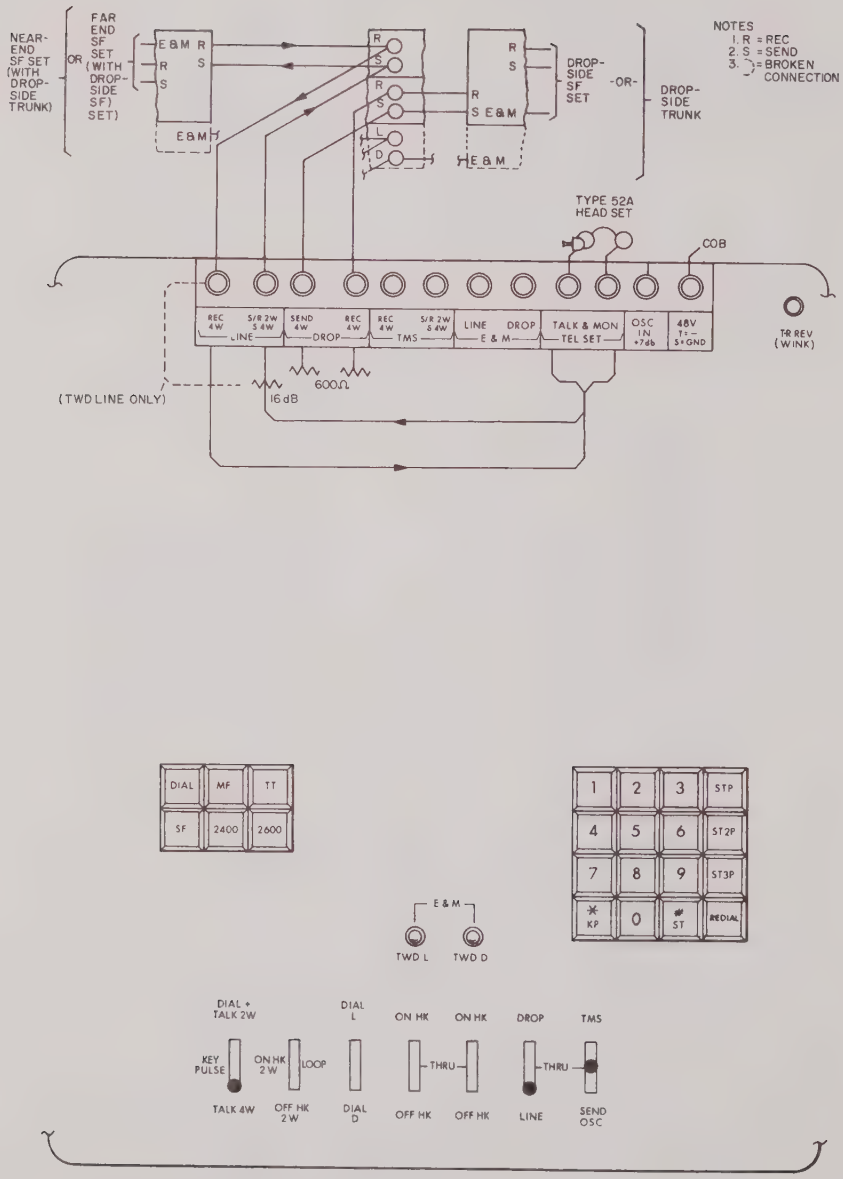


Figure 4—22. Talking on Four-Wire Circuit Toward Line.

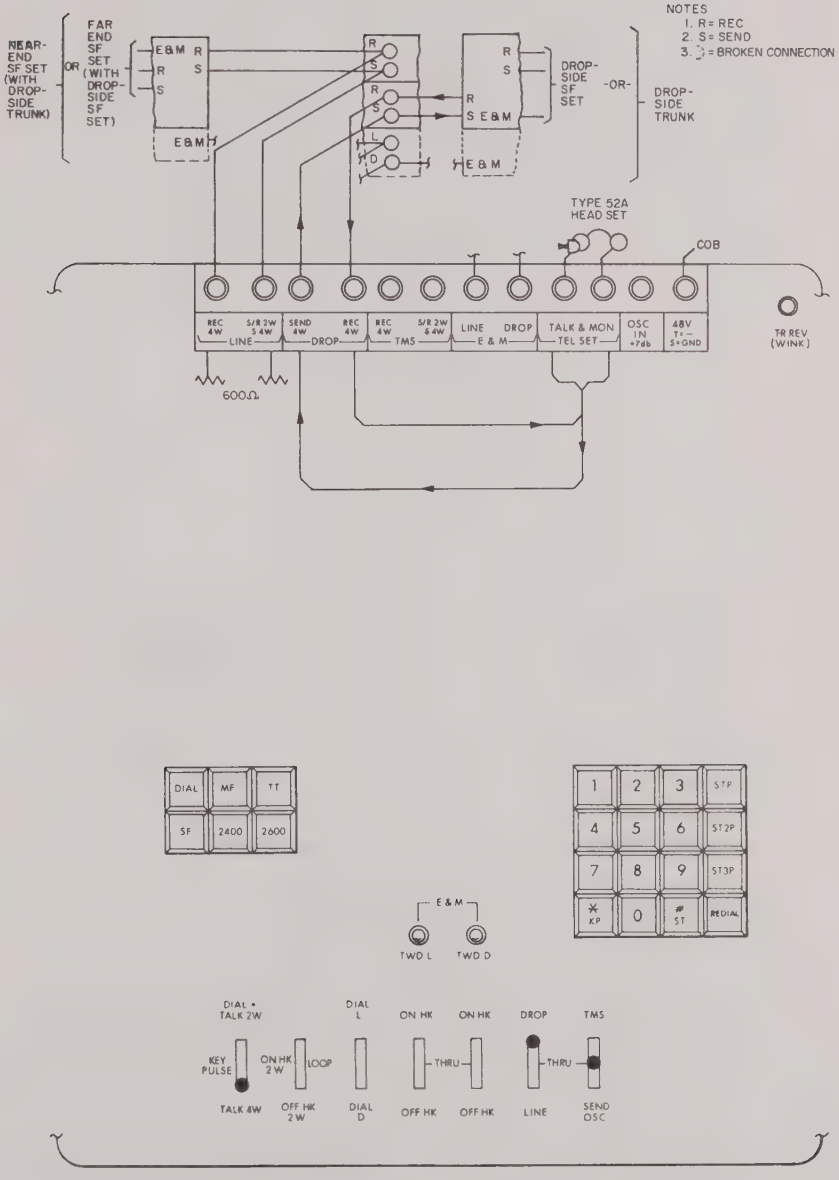


Figure 4—23. Talking on Four-Wire Circuit Toward Drop.

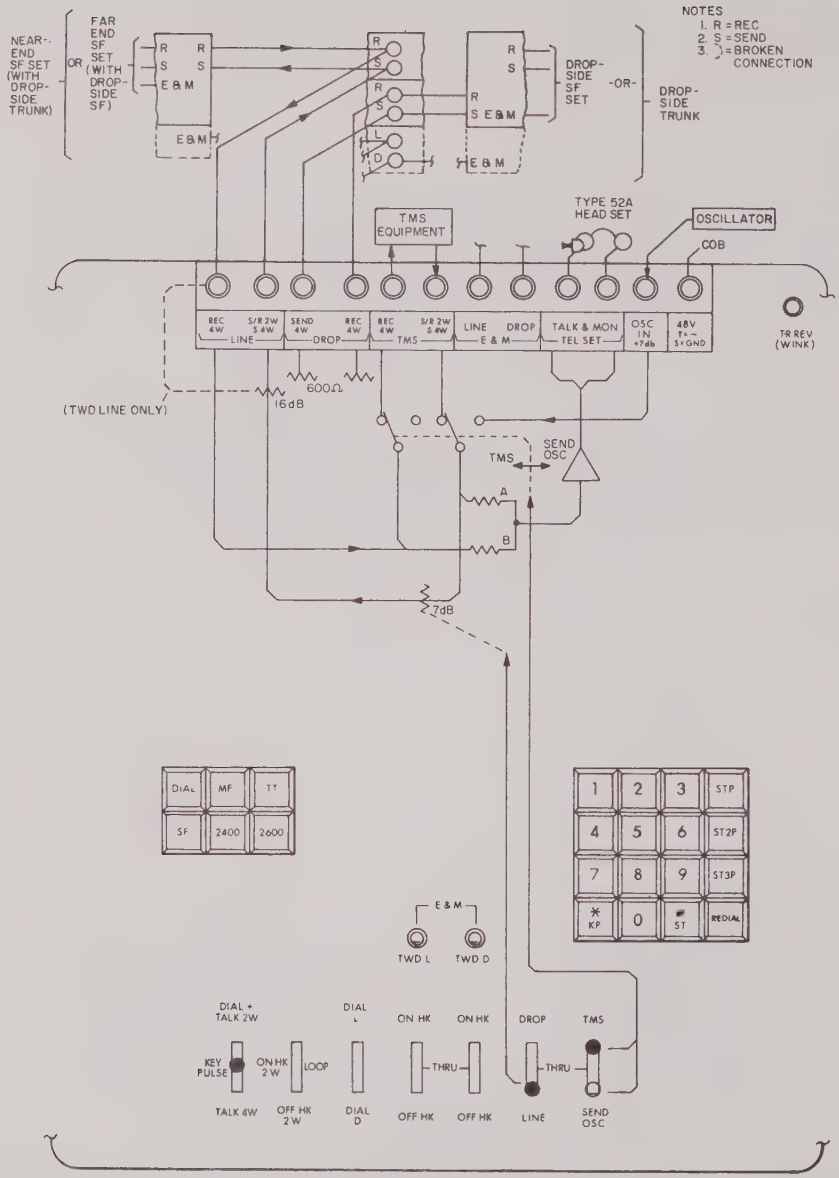


Figure 4—24. TMS and Oscillator Operations on Four-Wire Circuit Toward Line.

4.65 EXTERNAL TMS OPERATION ON A FOUR-WIRE CIRCUIT.

4.66 Operations involving external TMS instruments on four-wire circuits are illustrated on Figures 4—24 and 4—25 for toward-the-line and toward-the-drop applications respectively.(Conditions are summarized as items 9 and 11 in Table 4—4). This procedure links with four-wire supervision and addressing procedures given in paragraphs 4.61 and 4.63.

1. Set up TMS instrument send and receive circuits.

2. Set the DIAL + TALK 2W/KEY PULSE/TALK 4W switch at KEY PULSE.

3. Set TMS/THRU/SEND OSC switch at TMS.

4. Incoming milliwatt signals are now routed to the TMS REC jack. In addition, the outgoing signals are routed to the circuit under test.

5. If it is necessary to re-establish communications, set the TMS/THRU/SEND OSC switch at THRU and the DIAL + TALK 2W/KEY PULSE/TALK 4W switch at TALK 4W.

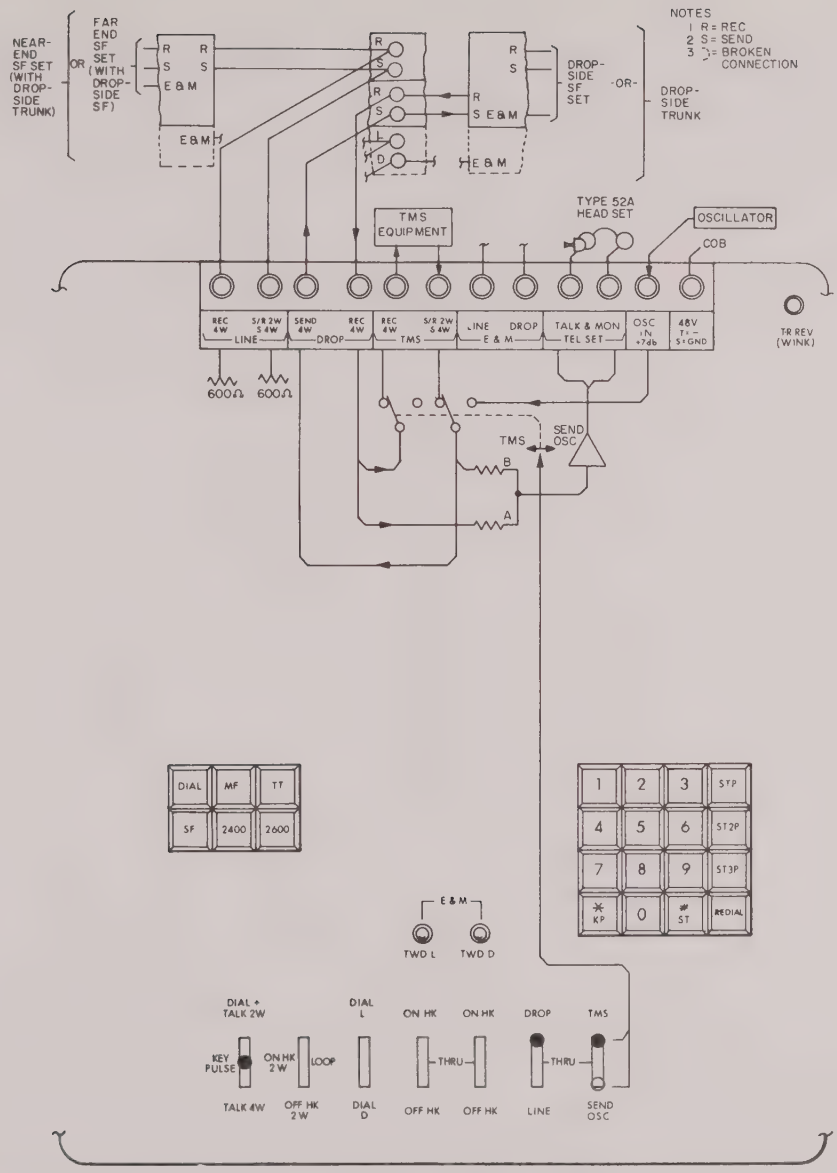


Figure 4—25. TMS and Oscillator Operations on Four-Wire Circuit Toward Drop.

4.67 EXTERNAL OSCILLATOR OPERATIONS ON A FOUR-WIRE CIRCUIT.

4.68 Operations involving oscillator inputs to the TTS59C for sending into four-wire circuits are illustrated in Figures 4—24 and 4—25 for toward-the-line and toward-the-drop applications respectively. This procedure links with four-wire supervision and addressing procedures given in paragraphs 4.61 and 4.63.

1. Set oscillator output level to +7 dBm.

2. Set DIAL + TALK 2W/KEY PULSE/TALK 4W switch at KEY PULSE.

3. Set TMS/THRU/SEND OSC switch at SEND OSC.

4. The outgoing oscillator signal is now routed to the LINE or DROP SEND jack as required. The level is −16 dBm at the LINE jack and +7 dBm at the DROP jack.

5. If it is necessary to re-establish communications, set the TMS/THRU/SEND OSC switch at THRU and the DIAL + TALK 2W/KEY PULSE/TALK 4W switch at TALK 4W.

MAINTENANCE MANUAL ORDER FORM

A maintenance manual can be purchased for the **TTS59C.** The manual contains theory of operation, circuit descriptions, maintenance/calibration information, schematics and other diagrams, and electrical parts lists.

To order the maintenance manual call: Northeast Electronics Spare Parts Department at **(603) 224-6511.** Or, complete the order form below and mail with a purchase order to:

Spare Parts Department
Northeast Electronics
Airport Road
P.O. Box 649
Concord, New Hampshire 03301

When ordering, specify manual part number: **A0059-30-601**

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Name:_____
Company:_____
Address:_____
City:_____
State:_____ **Zip:**_____
Equipment Serial Number:_____

Maintenance Manual Part Number: **A0059-30-601**

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